DRAFT SUMMARY OF THE NON-ORDNANCE AND EXPLOSIVES REMEDIATION TOURTELOT CLEANUP PROJECT

TABLE OF CONTENTS

TABLES:

FIGURES:

6-1 Groundwater, Surface Water and Subdrain Water Sampling Locations
7-1 Project Schedule

Attachment:

Attachment A – Process Flowcharts and soil screening levels

1.0 INTRODUCTION AND BACKGROUND

This Draft Summary of the Non-Ordnance and Explosives Remediation for the Tourtelot Project Site and portions of some adjoining properties (referred to in this document as the "Project Site") has been prepared by Northgate Environmental Management, Inc. The Project Site is located in the City of Benicia, Solano County, California (Figure 1-1). The Project Site boundary is shown in Figure 1-2.

This report has been prepared in accordance with the Imminent and/or Substantial Endangerment Determination and Remedial Action Order (Docket No. I/SE 98/99-011), signed June 1, 1999 (the "Order"), issued for the Project Site by the California Environmental Protection Agency (Cal/EPA), Department of Toxic Substances Control (DTSC).

The Draft Summary of the Non-OE Remediation is based on the Remedial Investigation/Feasibility Study (RI/FS) Report (Earth Tech, 2001a) completed for the Project Site. The RI/FS describes soil, surface water and groundwater sampling and analysis activities, and OE investigations at the Project Site. Major components of Alternative 5A (the RI/FS recommended alternative) include OE point clearance, excavation, treatment and disposal of non-OE affected soil, institutional controls, monitoring, and installation of a crushed bedrock layer in the residential areas. The RI/FS Report developed and evaluated alternatives for the remediation of both OE and chemically-affected soil at the site. This Draft Summary of Non-OE Remediation describes the technical and operational plans for remediating chemically-affected soils, in accordance with the RI/FS and Remedial Action Plan (RAP). The remediation of OE and OE scrap is addressed in a separate companion document, the OE RDD (Earth Tech, 2001b).

The Tourtelot Remediation Project proponents are Granite Management Corporation (Granite, the current owner of the Tourtelot Project Site) and the U.S. Army Corps of Engineers (USACE).

1.1 REMEDIAL DESIGN GOALS AND OBJECTIVES

The objectives of the project are as follows:

- Remediate the Project Site in a manner and to standards that would allow DTSC to determine that all appropriate response actions have been completed and that no further removal/remedial action is necessary for the Project Site under the Order issued by DTSC on June 1, 1999 (Docket No. I/SE 98/99-011);

- Remediate the areas of the Project Site that the Benicia General Plan designates for residential or park use to a standard suitable to allow unrestricted use of residential lots and the park

- Remediate the other areas of the Project Site to a standard suitable for open space use consistent with the City of Benicia General Plan and Zoning

Ordinance.

Future land use at the Project Site is shown on Figure 1-3.

The OE remedial activities will be completed prior to or coordinated with the remediation of chemically-affected soils. The nature of each geophysical anomaly will be identified in the field by a qualified OE contractor. Each anomaly will be uncovered and the source of the geophysical signature will be characterized. This information will be used to assess if the Flare Site and the Demo Site were used for demolition of ordnance. The following OE activities are proposed:

- Surface preparation;

- Surface and point clearance and removal of all detected anomalies across the entire Project Site, including appropriate disposal of any OE, OE scrap, and non-OE metallic debris;

- In areas where point clearance is being performed in lifts, including portions of TNT Strips, Demolition Site 3, Flare Site; non-OE remediation of chemically-affected soils will occur concurrently with OE clearance activities to ensure that all chemically-affected soils are segregated from clean soils that meet remedial goals;

- Homogenization, excavation, stockpiling and removal of soil with trinitrotoluene (TNT) concentrations at or above 10 percent by weight;

- Area-wide clearance of soils potentially containing OE to ensure clearance of OE from areas that are planned for future residential use in the South and North Valleys, and on the Ridge;

- Excavation, treatment as needed, and transportation offsite of chemically-affected soil; and

- Grading of soil with no potential to contain OE to provide clean fill soil (does not contain OE and meets final remedial goals) for fill in North Valley and grading to create the crushed bedrock layer above area wide cleared soils in future residential areas.

The goal of the non-OE remedial design is to identify chemically-affected soil that exceeds final remediation goals, and to remove this material from the Project Site. The non-OE RDD meets the requirements of Section 5.11 of the DTSC Order, which include:

- Description of equipment used to excavate, handle, and transport affected material;

- A field sampling and laboratory analysis plan addressing sampling during implementation and to confirm achievement of the performance objectives of the

RAP;

- A transportation plan identifying routes of travel and final destination of wastes generated and disposed in accordance with the implementation of the RAP;

- An updated health and safety plan addressing the non-OE implementation activities; (Earth Tech 2001d)

- Identification of any necessary permits and agreements;

- An operation and maintenance plan, including required monitoring; and

- A schedule for implementation of proposed non-OE remediation activities.

1.2 REGULATORY OVERSIGHT

On June 1, 1999, DTSC issued an Order stating that removal and remedial action are necessary at the site because there may be an imminent or substantial endangerment to the public health or welfare or to the environment. The DTSC is the lead agency overseeing the investigation and remediation of the Project Site.

It is intended that work being performed under the Order will be consistent with, and based on, the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) (42 U.S. Code [U.S.C.], 9601 et seq.), as amended; the National Hazardous Oil and Substance Pollution Contingency Plan (NCP) (40 Code of Federal Regulations [CFR] Part 300), as amended; the Health and Safety Code (H&SC) Section 25300 et seq., as amended; state laws and regulations and other current and applicable Environmental Protection Agency (EPA) and DTSC guidance and standards.

The Superfund Amendments and Reauthorization Act (SARA) requires that remedial actions at federal Superfund sites achieve a cleanup level that protects human health and the environment. In addition, cleanups must attain legally applicable or relevant and appropriate requirements (ARARs) that are promulgated under federal or state law, unless a waiver is warranted. Although the Tourtelot Project Site is not a Superfund Site, the concept of ARARs has been used to evaluate and select final remedial actions for the proposed future residential and open space use of the Project Site.

The following local, state, and federal agencies have jurisdiction over remedial activities at the Project Site:

- California Environmental Protection Agency (Cal EPA) DTSC (the lead regulatory agency for investigation and cleanup of the Project Site);

- USACE (issuance of a Section 404 permit for filling of 0.093 acre of wetlands in the North Valley and 0.206 acre of seep wetlands on the north slope of the South Valley);

- U.S. Fish and Wildlife Service (USFWS) (endangered species consultation if required by USACE Section 404 permit);

- California Department of Fish and Game (CDFG) (issuance of a Section 1603 streambed alteration agreement);

- Bay Area Air Quality Management District (BAAQMD) (responsible for protection of air quality);

- California Occupational Safety and Health Administration (Cal/OSHA) (has oversight authority for worker protection during removal activities);

- California Regional Water Quality Control Board (RWQCB) (has responsibility for protection of groundwater and surface water quality);

- City of Benicia (has authority to issue grading permits for the Project Site); and

- Solano County Department of Environmental Management (has authority to issue well permits and oversee underground storage tank [UST] removals).

1.3 ORDNANCE AND EXPLOSIVES SAFETY ISSUES

OE has been found on the Project Site. When investigating sites that may contain OE and OE scrap (inert and non-hazardous), the Department of Defense (DOD) often intends the term OE to be inclusive of all ordnance items that may be found at a site. OE is defined by USACE as either:

- Ammunition, ammunition components, and explosives that have been abandoned, expelled from demolition pits or burning pads, lost, discarded, or buried. Such ammunition, ammunition components, and explosives are no longer under accountable record control of any DOD organization or activity.

- Explosives soils (mixtures of explosives in soils, sand, clay, or other solid media at a concentration [equal to or above 10 percent by weight] such that the mixture itself is explosive) (U.S. Army Corps of Engineers, 2000).

Based on historical research, it has been established that the OE at the Project Site did not originate from artillery firing or bombing range activities, but from demilitarization/demolition activities reported to have occurred in specific areas of the former arsenal locations. These areas are shown on Figure 1-4.

Following the completion of OE clearance activities, subsurface investigations will be completed in those areas of the Project Site that could not be sufficiently evaluated due to use of avoidance techniques during RI investigations.

1.4 BACKGROUND

Information presented in these sections was taken from the *Archives Search Report* [ASR] *Findings, Benicia Arsenal, Benicia, Solano County, California* (U.S. Army Corps of Engineers, St. Louis District, 1994a); *Supplement to the March 1994 Archives Search Report for Benicia Arsenal, Benicia, Solano County, California* (U.S. Army Corps of Engineers, St. Louis District, 1997); *Environmental Assessment, Benicia Arsenal Site Investigation, Benicia, California* (U.S. Army Corps of Engineers, Sacramento District, 1997); and *Final Benicia Arsenal Records Research Report* [RRR] (Jacobs Engineering, 1999); *Final Engineering Evaluation/Cost Analysis, Former Benicia Arsenal, Solano County, California* (U.S. Army Corps of Engineering and Support Center, Huntsville, 2000); and the Final RI/FS Report (Earth Tech, 2001).

1.4.1 Site Topography

The Project Site is situated in a hilly area dominated by a central, east/west-trending ridge (referred to as the "ridge") (see Figure 1-4) that acts as a drainage divide between a major drainage swale to the south, referred to as the South Valley, and a smaller drainage swale to the north, referred to as the North Valley. Project Site elevations range from approximately 60 feet to 250 feet above mean seal level (MSL) in the South Valley and 110 feet to 260 feet above MSL in the North Valley. The top of the Ridge, which was excavated as part of previous grading activities, is approximately 230 feet above MSL toward the east end and approximately 260 feet above MSL toward the west end. The maximum current elevation on the ungraded western portion of the Ridge is approximately 300 feet above MSL. The Project Site is bordered by the Southampton residential development to the west and south, industrial and commercial facilities to the east and south, and open space to the north.

1.4.2 Environmental Resource Data

Environmental resource data are provided in the Draft Environmental Impact Report (EIR) (Earth Tech, 2001e). The draft EIR describes the plant and animal resources present at the Project Site. The majority of the Project Site is covered with non-native annual grassland vegetation. The hillsides, ridgetops, and some of the valley floor areas of the Project Site are dominated by weedy introduced plant species. The unnamed creek that crosses the South Valley supports both willow riparian and freshwater marsh vegetation/habitat. Wetlands vegetation is present in creek and seep areas on the hillsides. The areas identified as jurisdictional wetlands are shown on Figure 1-5. Willow riparian and freshwater marsh areas are present on the southern portion of the project site. Sensitive wildlife species that may occur on the project site include the Suisan Song Sparrow, a federal Species of Concern that has been observed in the immediate project site vicinity. The federally listed endangered American Peregrine Falcon may forage over the Project Site, but would not be expected to nest in the area because of the lack of suitable cliff sites.

The Conceptual Site Model for chemically-impacted media (Figure 1-6) outlines potential human exposure pathways.

1.4.3 Past and Current Land Uses

The previous military uses of the Project Site are depicted in Figure 1-4. TNT was laid out in strips (TNT Strips) along the hillside and may have been burned. Approximately 3.5 acres in the North Valley were developed with roads and structures where the accuracy of howitzer gun barrels was checked (Howitzer Test Facility), ordnance was inspected and renovated, and primers were destroyed in a "squirrel cage" (Ammunition Renovation/Primer Destruction Site). There was also a disposal area referred to as the "North Valley Military Landfill" in the North Valley. Part of the Ridge was reportedly used to dispose of aged, out-of-service dynamite (Dynamite Burn Site).

In the South Valley, there was a Flare Site and three suspected demolition sites (Demolition Sites #1, #2, and #3). The Flare Site was used to burn old, out-of-service flares. Demolition activities generally consisted of placing various amounts of out-of-service munitions in a "pit" placing a countercharge on top of the items, and detonating them.

1.4.3.1 TNT Strips

There are five linear features on the northern hillside of the North Valley, referred to as the TNT Strips #1 through #5. A possible sixth TNT strip between TNT Strips #3 and # 4 was identified during an aerial photographic review. It has been assumed that the burning of explosives resulted in the TNT Strips on the hillside above the North Valley (see Figure 1-4). The TNT Strips are apparent by a lack of ground cover and analytical testing of soil. The strips are clearly visible in a December 1947 aerial photograph, but are not visible in a January 1945 aerial photograph. Historical records do not indicate when actual TNT destruction operations took place, nor do they indicate the method of destruction. The identified strips vary in length from approximately 100 feet to 800 feet; each is approximately 6 feet wide. Exposed soil along the strips is characterized by a deep red color with crystalline materials observed in the dry season.

1.4.3.2 Howitzer Test Facility

The Howitzer Test Facility consisted of four structures in the North Valley (see Figure 1-4). The first structure, Building 181, consisted of two parallel concrete tunnels constructed in 1945 on an excavated pad into the northeast-facing flank of the Ridge; each had a 10-foot by 10-foot opening and extended approximately 100 feet toward the hillside. The concrete tunnels were oriented approximately north-south and were partially covered with soil. The second structure, Building 182, contained the open test firing butts and was also constructed in 1945 in the middle of the North Valley, at the base of the southwest-facing hillside, approximately 450 feet north of the entrance to the tunnels.

The third structure, Building 183, was a concrete powder loading room constructed in 1945 immediately west of the test firing butts. The fourth structure consisted of two buildings (Buildings 540 and 542) and included another unidentified structure. This structure was situated between the firing butts and the test tunnels. Reportedly, the buildings, which were built in 1957 (Building 540) and 1958 (Building 542), had several uses after the Howitzer Test Facility ceased operations. Building 540 was 12 feet by 20 feet, but no records of the size of Building 542 are available. None of the buildings are present on the site today.

During the initial site preparation activities, gravel/debris was removed from inside the test tunnels. The soil cover over the concrete tunnels was also removed, and the tunnels and other structures in the area were dismantled. The removed gravel/debris and soil were screened under the observation of a qualified explosives specialist. The debris from inside the tunnels consisted primarily of gravel and howitzer shells filled with pea gravel or plaster and inert scrap. Some non-DOD-related debris was also removed (e.g., a burned-out car).

The soil removed from over the tunnels also contained gravel- or plaster-filled howitzer rounds. The gravel/debris and soil were screened for OE, and as much as possible was sorted into two stockpiles. One soil stockpile was relatively free of OE scrap; the other had gravel and small fragments of OE scrap. As dismantling activities continued, OE scrap (inert ordnance and practice landmine fuses with pins) were found beneath Building 540. The Howitzer Test Facility area was geophysically mapped, and all observed anomalies were investigated and removed. Excavated and screened soil from the OE clearance activities was also placed in the soil stockpile. The two stockpiles were subsequently moved around the Howitzer Test Facility area to accommodate a complete geophysical survey of the area. The two stockpiles were eventually consolidated into a single stockpile (North Valley Stockpile #3). No live OE items resulting from the howitzer test activities have been reported or discovered.

1.4.3.3 North Valley Military Landfill

Based on historical information, the disposal area referred to as the North Valley Military Landfill is thought to have existed in the North Valley, just east of the Howitzer Test Facility (see Figure 1-4). The disposal area was apparently first used when the tunnels were constructed in 1945 and was in operation until approximately 1955, when the testing activities ceased. The area was originally a poorly-defined drainage pathway that was reported to have been gradually filled with shell casings, inert scrap, and debris dug out of the test tunnels after artillery testing.

During the 1996 initial site preparation activities at the Howitzer Test Facility, an area of debris consisting of wood crates, wood pallets, and packing materials was encountered northeast of the previously estimated disposal area to a depth of no more than 5 feet bgs. Some inert ordnance, including practice 155 mm howitzer rounds (gravel or plaster-filled), was also recovered and removed from this area during the OE clearance of the Howitzer Test Facility. The wood debris and packing materials were added to the screened soil stockpile and eventually consolidated into North Valley Stockpile #3.

In May 2000, the landfill was investigated as part of the site RI. During this investigation, the landfill was investigated using back hoe-excavated test pits. Each test pit was cleaned of metallic anomalies by OE technicians. Approximately one-half of the anomalies investigated were classified as OE scrap. No OE items were recovered.

1.4.3.4 Ammunition Renovation/Primer Destruction Site

The Ammunition Renovation/Primer Destruction Site is in the North Valley adjacent to the Howitzer Test Facility (see Figure 1-4). The Ammunition Renovation/ Primer Destruction Facility was constructed on a relatively flat surface partially paved with asphalt at the upper reaches of North Valley, near the drainage divide, and was operational from 1945 to 1947. Typically, at primer destruction facilities, primers were destroyed by being dumped and burned in a “squirrel cage” or metal tank. Primers for various munitions were pulled out, removed, and placed onto a conveyor belt, then dropped into a cage and burned. An oil burner was usually attached to the cage or tank and was left running constantly in order to ignite the primers.

The Ammunition Renovation Facility consisted of two wooden buildings and two canvas shelters (Jacobs, 1999), which were used to inspect and refurbish ordnance items stored at the Benicia Arsenal. The RRR (Jacobs, 1999) stated that the area was used for breakdown operations, cleaning, and processing of ammunition casings in preparation for painting.

During the 1996 initial site preparation activities, the wooden structures were dismantled and the construction debris removed from the Project Site. Asphalt paving, which partially covered the Ammunition Renovation/Primer Destruction Site, was removed, along with 1 to 2 feet of underlying soil and placed in two stockpiles along the north edge of the Project Site (North Valley Stockpile #1 and #2). No OE items were found.

1.4.3.5 Dynamite Burn Site

On the Ridge, aged, out-of-service dynamite was reportedly disposed of through burning (see Figure 1-4). Aged dynamite was burned by placing multiple sticks of dynamite in rows up to 100 feet long on a piece of paper and igniting the paper. This area is reported to have been used continuously for 3 months in 1947 and 1948 until all of the dynamite was destroyed (Jacobs, 1999). Inspection of aerial photographs taken on December 1, 1947, reveals a criss-cross pattern of dark and lighter strips oriented approximately northeast-southwest and northwest-southeast, which is interpreted to represent the burn strips.

The Ridge containing the Dynamite Burn Site was excavated during grading activities associated with the Southampton development in 1990. Based on an analysis of past grading activities, soil from the historical location of the Dynamite Burn Site appears to have been placed as fill at or near the base of the McAllister Drive Land Bridge.

1.4.3.6 Flare Site

The Flare Site is situated in the South Valley, on the south side of the wetlands, and is visually evident by the residual ash on the ground surface (see Figure 1-4). The inspection of aerial photographs indicates that the site was situated over a landslide evident on the earliest available aerial photographs (1937). The Flare Site was used to dispose of flares by burning them (Jacobs, 1999). This usually consisted of placing flares on the ground in piles and igniting them. Although no evidence of burning was visible in the aerial photographs, physical evidence of burning (i.e., residual ash) remains at the Flare Site, as observed during recent site visits. It is uncertain if the Flare Site was used to dispose of ordnance. A relatively large number of anomalies is evident in the geophysical data.

1.4.3.7 Demolition Site #1

Demolition Site #1 is situated near the bottom of the South Valley on the south side of the wetlands (see Figure 1-4). A small drainage swale runs down the southern slope of the South Valley immediately to the east of the suspected demolition site. The site is clearly visible in a number of the historical aerial photographs and first appears circa 1945, although no evidence of the type of use is evident on the photographs. No live ordnance items have been recovered from this site during previous investigations; however, OE scrap and fragments have been recovered around and near the site. The site was included in the sitewide geophysical survey performed by NORCAL in 1997, and a large, magnetic anomaly is evident in the data at the south end of the suspected site. Several smaller anomalies are also evident

from the data in the north portion of the site.

1.4.3.8 Demolition Site #2

The area identified as Demolition Site #2 shows little or no evidence of use as a demolition site. The site is on the south side of the South Valley between the Flare Site and Demolition Site #1 (see Figure 1-4). The site appears disturbed or barren in several of the historical aerial photographs. However, disturbance in this area is also associated with a landslide/earthflow identified in that area on the 1945 and later photographs. Review of the sitewide geophysical data does not indicate a high anomaly count, similar to those of Demolition Sites #1 and #3, nor is there evidence of chemically-affected soils.

Because there is little or no physical evidence that this site was used as a demolition pit, it has been concluded that this site was not used.

1.4.3.9 Demolition Site #3

Demolition Site #3 is situated on the north side of the South Valley (see Figure 1-4). A total of four OE items was recovered from this site by Granite and USACE. Also, a half-track armored personnel vehicle was removed from this site, hauled up the north slope of the South Valley, and cut into pieces, which were recycled at a local metal fabrication shop. Demolition Site #3 is evident in the sitewide geophysical data and on the aerial photographs (since 1947); it coincides with a bench cut into the hillside. The topographic map shows the bench cut at an approximate elevation of 105 feet above MSL. The surface of the bench appears disturbed in several of the photographs.

1.4.4 Future Land Use

The future land uses are shown on Figure 1-3. The Unit D-1 portion of the site, which is south of the South Valley, has been graded for residential development, with streets and utilities installed. One unoccupied house has been constructed in the Unit D-1 area.

The South Valley remains relatively undisturbed, except for the past activities previously described. The Ridge was used as a soil borrow area and, subsequently, as a soil stockpile area for soils and debris brought from off site. The North Valley remains relatively undisturbed, except as previously described.

The Ridge, portions of the North Valley, and Unit D-1 areas are planned as a residential development. Most of the TNT Strip area is proposed for use as open space. A portion of Strip #5 is planned for future residential development. The South Valley and a portion of the North Valley will remain as open space (Figure 1-3).

1.4.5 Geologic Conditions

The bedrock at the Project Site, as observed in test pits, soil borings, and geophysical investigation throughout the area, is weathered and fractured and consists mostly of claystone with various interbedded deposits of sandstone and siltstone. Bedding units generally strike to the northwest and dip to the south.

Quaternary alluvium is present in the bottom of the North and South Valleys. The total thickness of the alluvium in the North Valley is as deep as 30 feet. Various amounts of colluvium blanket the slopes of the hills. The colluvium is generally a silty or sandy clay and ranges in thickness from a few feet to more than 12 feet.

Investigations at this site indicate that the depth to weathered bedrock ranges from approximately 2.2 to 11 feet bgs on the south slope of the South Valley, while the depth to weathered bedrock ranges from approximately 0 to 12 feet bgs on the north slope of the South Valley. The shallow soil depths on the north slope were found at the top of the slope. The alluvium in the South Valley floor is interpreted to attain depths of up to 15 feet and probably consists of fat clay that includes weathered fragments of shale, siltstone, and sandstone.

2.0 PROPOSED REMEDIATION ACTIVITIES

The RI/FS recommends that Alternative 5A be implemented at the Project Site. DTSC has reviewed the RI/FS and concurs that this alternative meets remedial criteria as defined in the NCP (40 CFR 300.430). The major components of alternative 5A are as follows:

- Point clearance of OE and OE scrap over the entire site, including surface preparation, surface clearance, geophysical investigation and mapping, removal and disposal of all detected anomalies, and a QA/QC scan of the entire Site after completing the initial point clearance. Wetland areas would be dewatered as necessary to expose the ground surface for surface clearance and geophysical mapping and removal activities.

- Area-wide OE clearance. Soil considered to have a potential to contain OE below the geophysical scan depth would be excavated in portions of the North Valley, South Valley and Ridge areas in future residential property, as well as overburden soil associated with D-1 lots. Soil would be scanned in place using geophysical techniques to identify metallic anomalies. Each lift would have a QA/QC activity consisting of re-scanning soils in the North Valley after placement in lifts, or an in-situ QA/QC scan. The lift would be excavated and taken to the bottom of the North Valley. The process of scanning, QA/QC and excavation in lifts would be continued until no OE or OE scrap is found in two consecutive lifts, or bedrock is encountered. Following point clearance and area-wide clearance, a layer of OE free crushed bedrock would be placed over area-wide clearance soil in future residential areas to provide additional protection against potential exposure to OE.

- Remediation of chemically-affected soil. Soil that contains chemicals at concentrations exceeding soil remediation goals in areas identified as requiring remediation would be removed from the Project Site and disposed at an approved off-site facility. Areas currently identified in the RI/FS include the TNT Strips, the Flare Site, Demolition Site 3, and Stockpiles #1, #2, and #3 on the floor of the North Valley. TNT Strip soils would be treated prior to removal, to assure that TNT concentrations are less than 10 percent. This treatment step involves in-situ homogenization using special equipment and procedures to safely lower the TNT concentrations of affected soils prior to excavation, loading, and removal from the Site.

- Institutional controls will be applied to portions of the Project Site through a Covenant to Restrict Use of Property. The institutional controls will apply to the streets and other paves areas in the portion of Unit D-1 that is within the boundaries of the Project Site, the currently paved portion of the McAllister Drive Land Bridge and parcels in the North and South Valleys that are designated in the City of Benicia's General Plan as open space (excluding an open space area in the North Valley which is designated for use as a park). The park site will be graded by making 20 to 50 foot cuts into bedrock and therefore will be OE free.

- The Non OE RDD contains a draft version of a Covenant to Restrict Use of Property that will be used to implement the institutional controls. The Covenant sets out the environmental restrictions that will apply to the affected areas and specifies procedures that will be required for "Excavation Activities" (as defined in the Non OE RDD). The document also will require that a notice be provided to the City of Benicia, DTSC, and USACE and that the activities would only be conducted using UXO technician support. The Covenant includes provisions that limit the ability of the owners of the restricted areas to change the land use designation or zoning of a restricted area if the change would be inconsistent with the restrictions imposed by the Covenant. After it is finalized and approved by DTSC, the Covenant will be executed and recorded in the Office of the Recorder, County of Solano, State of California. Once recorded, the Covenant will permanently apply to the restricted areas.

- Groundwater, surface water, and slope stability monitoring. Environmental monitoring would be performed to verify the effectiveness of the proposed remedial actions. These activities include sampling groundwater, subdrain water, seeps, and surface water, and testing the samples for constituents identified as chemicals of interest during the RI. Additionally, portions of the Site would be periodically monitored for erosion (e.g., gullies or indications of slope instability). The above monitoring activities would be documented in periodic reports, including recommendations for additional remedial activities, as needed.

The remedial components for OE are described in detail in the OE RDD. The Project Site has been divided into sectors to facilitate prioritization of OE clearance work and sequencing of associated tasks. Figure 2-1 presents the sector boundaries and significant features within each sector. Table 2-1 provides a description of each sector and its relevance to non-OE remediation activities.

Areas of interest at the Project Site have been characterized, as described in the RI/FS Report (Earth Tech, 2001a). Due to use of avoidance techniques during the investigation phases of the work, certain areas still lack full definition with regard to extent of the chemicals of interest; therefore, additional investigations are planned after the site-wide OE point clearance. As discussed below and summarized in Table 2-2, supplemental investigations will be carried out in portions of the Project Site as part of remediation, and through excavation confirmation sampling to ensure that remediation goals are met.

The following areas have been identified as requiring remediation:

1. TNT Strip Area;
2. North Valley Stockpiles #1, #2, #3;
3. Flare Site Area; and
4. Demolition Site #3.

A screening assessment of ecological and human health risks was conducted as part of the RI/FS, and the results were used to develop preliminary remedial goals for the project site (Earth Tech 2001a) and to identify areas requiring remediation. Table 2-3 provides the soil remediation goals that have been developed for the four

areas. Table 2-4 lists site-wide soil screening criteria. The lateral extent and depth of the proposed excavation areas will be determined following completion of the OE clearance activities and non-OE sampling activities. These locations will be remediated in accordance with the Non-OE RDD. Decision Process Flowcharts for each area are presented in Attachment A. A description of the investigative and remedial approach for chemically-affected soil in each area is provided below. The sampling procedures for each area will be provided in the Non-OE RDD Field Sampling and Laboratory Analysis Plan (FSLP).

2.1 TNT STRIP AREA

The TNT strips are located in Sector 9 (see Figure 2-1 and Table 2-1). The OE RDD describes the remediation activities proposed to treat, excavate, stockpile, and sample OE soils from this area. The entire TNT-Strips area will undergo geophysical scanning and point clearance of OE as discussed in Sections 1.1 and 2.0. A portion of the TNT Strips area may also undergo area-wide clearance in lifts. The lateral and vertical extent of chemicals in soil associated with the TNT Strips will be assessed through soil sampling during site excavation work. Figure 2-2 shows the proposed investigative sampling transects.

Figure A-1 in the attachment provides the decision process flowchart for the TNT Strip area. As shown on this figure, the investigative and remedial approach for the TNT Strip area (in conjunction with remediation of OE soils in accordance with the OE RDD) will be as follows:

- Soil sampling along step-out transects to assess the lateral and vertical extent of soils affected by TNT (Figure 2-2);
- Analysis of soil samples using approved field test methods (10% of these samples will be analyzed in the laboratory to verify the results of field tests);
- Excavation of soils affected by TNT at concentrations exceeding preliminary remedial goals (Table 2-3), If the excavation depth exceeds 7 feet, an additional sidewall will be collected at each location;
- Confirmation sampling to confirm that chemically affected soils have been removed (see Table 2-2 for analyses)
- Post-remediation risk assessment to determine final remediation goals

As discussed in Section 1.4.4 and shown on Figure 1-3, most of the TNT Strip area is proposed for use as open space. A portion of Strip #5 is planned for future development as residential property. TNT-affected soil in the future residential area will be remediated to the residential preliminary remediation goal (16 mg/kg), and the remainder of the area will be remediated to meet the recreational preliminary remediation goal (53 mg/kg; Table 2-3). All TNT-affected soils requiring remediation will be excavated and stockpiled adjacent to the TNT Strips for profiling and waste characterization.

2.2 NORTH VALLEY STOCKPILES #1, #2 and #3

North Valley stockpiles #1 and #2 are located in the Ammunition Renovation/Primer

Destruction Site and stockpile #3 is located in the Howitzer Test Facility Site, in Sector 8 (see Figure 2-1, 2-3 and Table 2-1). Stockpiles will be graded and geophysically scanned for OE in accordance with the OE RDD. If non-soil debris (e.g., concrete, wood, etc.) is in the soil, it will be separated under the observation of a UXO Technician and disposed at an appropriate off-site facility. After OE clearance is completed, soil samples will be collected from the graded stockpiles at a frequency of one sample per 1,000 to 1,500 cubic yards (depending on the total volume to be removed) as specified by the landfill accepting this material. The vertical extent of chemicals in soil below the former footprints of the stockpiles will be assessed through confirmation soil sampling.

Figure A-2 of Attachment A provides the decision process flowchart for the North Valley Stockpiles #1, #2 and #3. As shown on this figure, the investigative and remedial approach for the stockpiles will be as follows:

- Confirmation soil sampling below the footprint of the former stockpiles following OE grading and clearance;
- Analysis of confirmation soil samples for TEPH, PAHs, and metals (10% randomly selected);
- Further remedial efforts, if any, will be determined by comparing the results of confirmation sampling to preliminary remedial goals (Table 2-3) for PAHs and TEPH and screening levels (Table 2-4) for metals.
- Post-remediation risk assessment to determine final remediation goals.

2.3 FLARE SITE

The Flare Site is located in the South Valley, on the south side of the wetlands, west of the McAllister Drive Land Bridge, in Sector 5 (see Figure 2-1 and Table 2-1). The Flare Site area will undergo OE clearance during the Project Site boundary-to-boundary point clearance activities. After point clearance, a QA/QC scan will be performed to verify that all anomalies have been removed. Because of the potential for metal-affected soils below the depth of geophysical scans conducted during point clearance, the Flare Site will be scanned and excavated in lifts in accordance with the procedures specified in the OE RDD. Excavation will continue until metal-affected soil is removed. If the Flare Site is determined to be a Demolition Site, excavation will proceed to bedrock. The excavated soil will be stockpiled, pending further testing and evaluation, as detailed below.

The lateral and vertical extent of select metals in soil associated with the Flare Site will be assessed through soil sampling during the removal of soil in lifts. Remediation of the Flare Site will be performed as shown on Figure 2-4. Soils in this area will be remediated to the preliminary remedial goals listed in Table A2-3. The steps for remediation of chemically-affected soil in the Flare Site are described below.

After point clearance and QA/QC activities, soil samples will be collected on a 20-foot grid within the boundary of the estimated extent of metals-impacted soil at the Flare Site and at stepout transects and analyzed for select metals (antimony, barium, copper, lead, and zinc). Soils exceeding preliminary remedial goals (Table 2-

3) will be excavated in 1-foot lifts. Nearby exposed areas will be geophysically scanned prior to soil sampling and further excavation until all of the metals-affected soil has been removed. If the Flare Site is determined to be a demolition site, the excavation will proceed to bedrock. In the case where the metal impacted soil is shallower than bedrock, then the clean soil removed will be stockpiled for use as backfill pending results of the post remediation assessment.

When all metal-affected soil and metallic anomalies have been removed from the Flare Site, confirmation soil samples will be collected and analyzed in accordance with Table 2-2. If the excavation depth exceeds 7 feet, an additional sidewall will be collected at each location. If the confirmation sampling shows that any areas of the bottom of the excavation have concentrations exceeding preliminary remedial goals (for five metals and dioxin; Table 2-3), then further excavation and confirmation sampling will be performed until all the soil/bedrock with concentrations exceeding preliminary remedial goals is removed. A post remediation risk assessment will be performed to determine final remedial goals.

Chemically-affected soil stockpiles will be disposed offsite. Stockpiles with soil meeting final remedial goals will be used as backfill following completion and DTSC acceptance of the post-remediation health and ecological risk assessments.

2.4 DEMOLITION SITE #3

Demolition Site #3 is located in the South Valley, on the north side of the wetlands, west of the McAllister Drive Land Bridge, in Sector 5 (see Figure 2-1 and Table 2-1). The lateral and vertical extent of chemicals in soil associated with Demolition Site #3 will be assessed through soil sampling during the remedial excavation work. Investigation and remediation of Demolition Site #3 will be performed in two areas (Figure 2-5):

- Within the boundary of Demolition Site #3;
- Outside the boundary of Demolition Site #3

The steps for chemically-affected soil cleanup for the Demolition Site 3 are described below.

In accordance with OE clearance procedures described in the OE RDD, soil will be cleared within the boundary of Demolition Site #3 in lifts and each lift will be stockpiled separately. The stockpiles will be sampled at a rate of 1 sample per 1,000 to 1,500 cy as specified by the landfill depending on the total volume of soil.

Outside of the estimated extent of mercury-affected soils, the lateral and vertical extent of mercury impacted soil will be assessed by sampling along step-out transects (Figure 2-5). Soil will be excavated in 1-foot lifts. Nearby affected areas will be geophysically scanned prior to soil sampling and further excavation where mercury concentrations exceed the preliminary remedial goal.

When all mercury-affected soil has been removed from outside the Demolition Site,

and the soil within the boundary has been excavated to bedrock, confirmation soil samples will be collected on a 50-foot grid within the area (see Table 2-2 for analyses). If confirmation sampling shows that any areas of the bottom or sidewalls of the excavation have concentrations exceeding the preliminary remedial goals, then further excavation and confirmation sampling will be performed until all of the chemically-affected soil has been removed. Additional sidewall samples will be collected if the excavation is greater than seven feet deep. A post remediation risk assessment will be performed to determine final remedial goals. Chemically-affected soil stockpiles will be disposed of offsite as discussed in Section 2.5. Stockpiles with soil meeting final remedial goals will be used as backfill following DTSC approval of the post remediation health and ecological risk assessments.

2.5 SOIL HANDLING PROCEDURES

This section describes the general procedures that will be used to excavate, stockpile, backfill, and transport soils as part of the remedial actions for the Project Site. The proposed remediation areas include the TNT Strip Area; North Valley Stockpiles #1, #2, and #3; the Flare Site; and Demolition Site 3. Additionally, soil from other portions of the Project Site shown to be chemically impacted through investigations described in Chapter 3 will be excavated, stockpiled, and tested and disposed of off-site.

2.5.1 Excavation And Stockpiling Procedures

Equipment used to excavate and handle the soil will include excavators, scrapers and front loaders. Soil may be stockpiled for further characterization, or direct loaded into trucks or scrapers for removal from the excavation area. Soil stockpile areas will be bermed and covered with plastic sheeting, as necessary, to prevent storm water erosion and/or runoff and to control airborne particulate emissions. Plastic sheeting will be secured with tires, concrete or other appropriate material.

2.5.2 Transportation Procedures

Equipment used to transport excavated materials will include transfer trailers or end-dump trailers with tarpaulin covers for dust control, or scrapers in the case of onsite relocation of materials. Appropriate control measures will be implemented to minimize the generation of dust and decontamination of trucks to prevent the release of chemical-affected soils.

Measures may include, but are not limited, to brushing of tires, and other decontamination procedures, as necessary, prior to leaving the Project Section. Equipment used for excavation and loading of soils will be decontaminated before leaving the Site. Trucks exiting the Site will be inspected and logged for compliance with the Site decontamination requirements.

Soil for off-site disposal will be transported from the work area to one or more of the disposal facilities to be identified in the Non OE Transportation Plan. The Transportation Plan describes the transportation routes, traffic control and loading procedures, record keeping, and contingency procedures for offhauling materials

from the Project Site.

2.5.3 Storm Water Management

Storm water pollution prevention measures will be implemented as needed, in accordance with a Storm Water Pollution Prevention Plan developed for the Project Site. Water pollution control measures to be implemented may include 1) berming stockpile areas to contain run-off, 2) installation of storm drain filters and silt fence to remove sediments prior to discharge, and 3) installation of hay bales at appropriate locations to contain storm water run-off and to trap sediment.

2.5.4 Dust Control Measures

In general, dust control will be performed by applying water with a low-pressure spray system. Low volumes of potable water will be routinely spread in areas where dust may be generated as a consequence of remediation activities.

Dust control measures will include inspection and management of access roads used for entrance to or exit from the work zone. The use of vehicles will be restricted on and around the remediation, including limiting the speed of vehicles to prevent the generation of airborne dust. The excavation areas will be pre-wetted and followed with fine spray application on the immediate area being worked to eliminate visible dust to the extent possible. Water will be applied by means of truck(s), hoses and/or sprinklers prior to excavating soil in the work area to minimize dust emissions. Haul vehicles transporting soil into or out of the property will be covered. All visibly dry soil in areas of operation shall be watered to minimize dust emissions.

Soil stockpile surfaces will be moistened, as necessary, to control potential dust emissions from the soil stockpile(s). Adequately secured tarps, plastic or other material may be required to further reduce dust emissions. Chemical dust suppressants may also be applied if necessary to further control dust emissions. In the case where engineering control measures are not adequate (i.e., high and/or adverse wind conditions), the work will be suspended in all or in those portions where activities that are related to or may contribute to unacceptable dust levels.

3.0 PROPOSED POST POINT CLEARANCE INVESTIGATION ACTIVITIES

Certain areas of the Project Site were not fully characterized with respect to the lateral and vertical extent of chemically impacted soil due to the use of OE avoidance techniques during the investigation phases of work or additional investigation was requested by DTSC. Further investigation of these areas is proposed following OE clearance activities. Additional investigation of areas where chemical remediation is proposed is described in Section 2.1 through 2.4.

Additional investigation areas include the following:

- Potential underground storage tanks, Ammunition Renovation/Primer Destruction Site
- North Valley Hydrocarbon-impacted area
- Ridge Stockpiles
- Downgradient areas from the Dynamite Burn Site
- McAllister Drive Land Bridge
- 1945 Disturbed Area
- D-1 Stockpiles
- Demolition Site #1

Analytical data collected from these areas will be compared to preliminary remedial goals or to screening levels (if no preliminary remediation goals are available) in order to determine the need for further investigation.

The investigation activities proposed for these areas are presented in the following sections.

3.1 POTENTIAL UNDERGROUND STORAGE TANKS, AMMUNITION RENOVATION/PRIMER DESTRUCTION SITE

The Ammunition Renovation/Primer Destruction Site is located in the North Valley, in Sector 8 (see Figure 2-1 and Table 2-1). The entire Ammunition Renovation/Primer Destruction Site will undergo surface and point clearance of OE as discussed in Section 1.1. One or more Underground Storage Tanks (USTs) may be located in the Ammunition Renovation/Primer Destruction Site, based on previous geophysical scanning for metallic anomalies.

Figure A-4 of Attachment A presents the process flowchart that will be used to assess soil and groundwater quality if any USTs are found at the Ammunition

Renovation/Primer Destruction Site. If USTs are found in this area, the approach for the USTs will be as follows:

- Removal, inspection, testing of contents and disposal of USTs;
- Analysis of confirmation soil samples and groundwater, if present in the tank excavation;
- Further efforts, if any, will be determined by comparing the results of soil and groundwater sampling to criteria as established in the Tri-Regional Board Staff Recommendations for Preliminary Evaluation and Investigation of USTs (RWQCB 1990).
- If TPH are detected at concentrations exceeding 100 ppm in soil samples collected from the UST excavations, further soil sampling will be performed to assess the extent of TPH-affected soil.
- If groundwater in the tank excavation contains TPHg, TPHd, or BTEX at detectable concentrations, or soil samples in the step-out borings exceed 100 ppm for TPH, then groundwater monitoring well(s) will be installed to evaluate the hydraulic gradient and groundwater quality.
- Consult with RWQCB regarding remedial alternatives

3.2 NORTH VALLEY HYDROCARBON-IMPACTED SOIL

Soil sampling and chemical testing for petroleum hydrocarbons has been performed in the North Valley (see Figure 7-5 in the RI/FS). The lateral extent of the petroleum-affected soils was not fully defined during the RI. The Regional Water Quality Control Board has requested that the lateral extent of petroleum hydrocarbons be defined in the shallow soil layer (zero to 1 foot bgs) after OE point clearance activities are completed.

The proposed sampling locations for the petroleum hydrocarbon area are shown on Figure 2-3. The decision process flowchart for the area is illustrated in Figure A-6 of Attachment A. If the total extractable petroleum hydrocarbons (TEPH) concentrations in soil samples are less than the preliminary remedial goal, no further action will be proposed. If the preliminary remedial goal is exceeded, the need for further characterization will be evaluated. Soil samples will be collected along step-out transects as shown on Figure 2-3 to define the lateral extent of the shallow TEPH-affected soil.

3.3 RIDGE AREA STOCKPILES

Nine soil stockpiles (Stockpiles #1 through #9), totaling approximately 33,800 cubic yards, are located on the Ridge between the North and South Valleys (see Figure 3-1). During remedial investigation, no chemicals were detected in soil samples from the stockpiles at concentrations above preliminary remediation goals.

Figure A-5 of Attachment A describes the decision process flowchart for the Ridge Area Stockpiles. The stockpiles will be graded and geophysically scanned for OE in accordance with the OE RDD. Non-soil debris (e.g., concrete, wood, etc.) will be separated and disposed at an appropriate off-site facility.

After OE clearance is completed, one sample per 1,500 cubic yards of stockpiled soils will be field screened using a photoionization detector (PID) to measure volatile organic compounds. If PID readings are greater then 10 parts per million, a sample will be submitted to the laboratory and tested for VOCs. Unaffected Ridge stockpile soils may be used onsite for fill in the bottom of the North Valley pending results of the post remediation risk assessment or disposed at an appropriate landfill.

After stockpiles have been removed, confirmation soil samples will be collected to verify the soil/bedrock below the stockpile is not chemically-affected.

3.4 DOWNGRADIENT AREAS FROM THE DYNAMITE BURN SITE

The Dynamite Burn Site is located in the central portion of the Ridge (see Figure 3-2). In 1990, the Ridge was used as a borrow site for fill material to construct the McAllister Drive Land Bridge, and later as a source for off-site fill. Down slope of the former Dynamite Burn Site are soils that were present at the time of the operations. These soils are in areas that may be excavated (as part of the area-wide clearance activities) and placed in the bottom of the North Valley.

Figure A-6 of Attachment A provides the Process Flowchart for the area Downslope of the Former Dynamite Burn Facility. The approach is intended to investigate those soil areas where surface runoff and possibly subsurface groundwater flow may have carried explosives or other chemicals from the Dynamite Burn Site prior to the 1990 grading. Soils samples will be collected and analyzed to evaluate if these soils have chemical concentrations exceeding the preliminary remedial goals or screening criteria (Table 2-4). If the investigation shows that the concentrations of chemicals are less than the screening criteria, no remedial activities will be proposed. If the screening criteria are exceeded, the need for further characterization will be evaluated.

3.5 McALLISTER DRIVE LAND BRIDGE

The McAllister Drive Land Bridge is located at the southeast end of the South Valley (see Figure 2-1 and 3-3). In 1990, the Ridge between the North and South Valleys was used as a borrow site for fill material to construct the McAllister Drive Land Bridge. A photograph of the Ridge from 1950 shows a possible communication tower on the Ridge. DTSC has requested that additional soil sampling be performed to further evaluate the McAllister Drive Land Bridge soils. Specifically, DTSC has requested that soils be tested for chemicals associated with the communications tower and that TNT be added to the list of substances for analytical testing

The Process Flowchart for the McAllister Drive Land Bridge is shown on Figure A-6 of the Attachment A. If the concentrations are below the screening criteria or preliminary remedial goals, it will be concluded that the area has not been affected, and no further action will be undertaken at this location. If the concentrations exceed the screening levels or preliminary remedial goals, the need for further characterization will be evaluated.

3.6 1945 DISTURBED AREA

A Disturbed Area was noted on a 1945 aerial photograph in the northern portion of the Ridge (see Figure 3-4). The soils in this area are slated for excavation and placement in the bottom of the North Valley. Soil samples will be collected to verify that they meet remedial goals (Table 2-4).

The Process Flowchart for the 1945 Disturbed Area is shown on Figure A-6 of Attachment A. If the investigation shows that the concentrations of chemicals are less than the preliminary remedial goals or screening criteria, no further action will be proposed. If the preliminary remedial goals or screening criteria are exceeded, the need for further characterization will be evaluated.

3.7 D-1 AREA STOCKPILES

The D-1 Stockpile has a total volume of approximately 8,000 cubic yards (see Figure 3-1). It will be graded and geophysically scanned for OE in accordance with the OE RDD. Non-soil debris (e.g., concrete, wood, etc.) will be separated and disposed at an appropriate off-site facility.

The Process Flowchart for the D-1 Area Stockpile is presented in Figure A-5 of Attachment A. After OE clearance is completed, the soil from the stockpile will be tested for chemicals identified in Table 2-2, and other constituents specified by the anticipated disposal facility.

If soil from the stockpile contains any chemicals above preliminary remedial goals or screening criteria, samples will be collected below the footprint of the stockpile following stockpile removal and OE clearance of this area. Based on the results of confirmation sampling, the need for additional remedial actions or characterization will be assessed.

3.8 DEMOLITION SITE # 1

Demolition Site #1 is located on the south side of the wetland in the South Valley, in Sector 5 (see Figures 2-1 and 3-5). Demolition Site #1 will be investigated following point clearance of anomalies and a QA/QC scan to verify all anomalies have been removed. The history of the Demolition Site # 1 indicates that OE may be found deeper than the reliable depth of the geophysical scans. Therefore soils will be removed from within the boundaries of Demolition Site #1 in lifts following geophysical scanning. The excavation will proceed to bedrock if Demolition Site #1 is identified as a demolition site. Ten percent of the confirmation samples will be analyzed for dioxins/furans.

The process Flowchart for the Demolition Site #1 is presented in Figure A-3 of Attachment A. Each lift of soil removed from Demolition Site #1 will be stockpiled separately and will be sampled and analyzed for constituents specified in Table 2-2. If chemical constituents exceed screening criteria or preliminary remedial goals, the need for further characterization will be evaluated.

4.0 PROJECT SUPPORT PLANS

4.1 SITE-SPECIFIC SAFETY AND HEALTH PLAN

The investigation and remediation activities proposed in this Draft Summary of Non-OE Remediation will be implemented in accordance with the project Site-Specific Safety and Health Plan as amended by Addendum 1 (Earth Tech, May 2001). All field personnel including subcontractors will be required to read and sign the SSHP. The SSHP provides procedures to be employed during all on-site work activities.

4.2 FIELD SAMPLING AND LABORATORY ANALYSIS PLAN

FSLP is in preparation and will be included in the Non OE RDD. The FSLP will address sampling during implementation of field activities, including Non OE RDD investigations, excavation and removal activities, and post-remediation monitoring. This document will apply for all sampling activities and field measurements performed as part of the remedial design implementation.

4.3 QUALITY ASSURANCE PROJECT PLAN

During all non-OE RDD remediation activities, QA/QC protocols described in the Project Quality Assurance Project Plan (QAPP) will be followed. The QAPP is in preparation and will be included in the Non-OE RDD.

4.4 TRANSPORTATION PLAN

The Transportation Plan addresses the procedures, regulations, and other requirements related to transportation of materials and equipment as part of the remedial design implementation. This plan identifies the procedures for controlling traffic, proposed transportation routes, loading and decontamination procedures, and other details related to remediation design implementation. The Transportation Plan will be included in the Non-OE RDD.

4.5 REGULATORY APPROVAL AND PERMITS

Regulatory requirements are specified in Appendix H-1 of the RI/FS (Proposed ARARs) and the EIR. The applicability of and compliance with these requirements is addressed in detail in the EIR, and summarized below. ARARs are classified as location-specific requirements (e.g., protection of wetlands), action-specific requirements (e.g., management of storm water), and chemical-specific (e.g., compliance with air emission standards for particular type of air pollutant).

Location-specific ARARs would likely include the following laws and associated regulations:

- Federal Clean Water Act, Section 404

- California Fish and Game Code Section 1603

- Endangered Species Act

- California Endangered Species Act.

Action-specific ARARs are anticipated to include:

- Underground Storage Tank Requirements specified in CCR Title 23.

- Hazardous Waste Laws Regulations specified in California Health and Safety Code (HSC) Division 20, Chapters 6.5 and 6.8, and their associated regulations in CCR Title 22.

Chemical-specific ARARs include:

- Hazardous Waste Identification Regulations specified in CCR Title 22.

4.6 PUBLIC PARTICIPATION PLAN

The adjoining community and other interested parties will be informed of the activities conducted at the Project Site, in accordance with the Public Participation Plan (PPP). Public meetings will be held and fact sheets prepared as major milestones in the non-OE removal/remediation are achieved, in accordance with the PPP for the Tourtelot Project Site Remediation (Granite Management Corporation, September 1999).

An information repository has been established by the City of Benicia, Granite, and the USACE at the Benicia Library, 150 East L Street, Benicia California. The repository maintained by Granite provides local access to various reports, fact sheets and significant documents generated during the continuing investigation and remediation of the Project Site.

A Community Advisory Group formed by the DTSC and the City of Benicia reviews and comments on the primary documents prepared for the Project. Project information contacts at the DTSC, the USACE, the City of Benicia and Granite are provided in Table A4-1.

5.0 POST-REMEDIATION HUMAN HEALTH AND ECOLOGICAL RISK ASSESSMENTS

A post-remediation risk assessment will be conducted to ensure that the residual chemical concentrations are protective of human health and the environment. The post-remediation risk assessments will be based on data collected from confirmation samples in remediation areas and in areas that were not remediated, and will be completed in accordance with standard state and federal guidance for risk assessments.

The post-remediation risk assessments will differ from the screening-level assessments presented in the RI/FS Report (Earth Tech 2001a) in several important ways. For example, post-remediation chemical concentrations used to evaluate residual risks to human health will be based on the 95th percent upper confidence limit of the arithmetic mean rather than the maximum detected concentration, taking into account the size of the potential exposure area (e.g., the size of the residential lots in the future residential area). In addition, areas of the site that will remain as open space, as specified in a covenant to restrict the property, will be evaluated based on a recreational scenario rather than a residential scenario. With regard to ecological receptors, the post-remediation risk assessment also will be based on average rather than maximum concentrations, and will take into account the other site-specific issues such as home range. The assessment will evaluate cumulative human health and ecological risk from all complete exposure pathways.

The post-remediation risk assessments will be used to help identify any additional areas requiring remediation, if necessary, and identify the final remedial goals for the Project Site that are protective of human health and the environment.

6.0 OPERATION AND MAINTENANCE PLAN

Following the completion of remediation activities, operation and maintenance (AO&M) activities will be performed to monitor and maintain the effectiveness of the remedial actions at the Site. The O&M activities include groundwater, surface water, subdrain and seep monitoring, wetlands mitigation monitoring, erosion control, and slope stability monitoring. Wetlands mitigation and slope stability monitoring will be detailed in Appendices E and F of the Non OE RDD, respectively.

The following sections provide an overview of the O&M activities.

6.1 WETLANDS MONITORING

Wetlands maintenance and monitoring activities are discussed in Wetlands Mitigation Plan detailed in Appendix E of the Non-OE RDD. The wetlands should be self-sustaining and maintenance-free over the long term. Initial maintenance during the first five years after remediation will consist of visual assessments of the wetlands hydrology, soil, and vegetation. The Wetlands Mitigation Plan also discusses contingency measures to be implemented if the wetlands mitigation efforts do not achieve annual or final success criteria.

6.2 SLOPE STABILITY AND EROSION MONITORING

Slope stability and erosion monitoring will be conducted to evaluate the stability of areas that have been point cleared in the South Valley, including evidence of landsliding or erosion. Details of this monitoring plan will be described in Appendix F of the Non-OE RDD. This plan describes monitoring measures that will be carried out at the Project Site to assess the state of slope stability and erosion and actions to be taken if signs of slope instability or erosion are observed. It also lists parties to be notified if instability or erosion is observed. The slopes will be monitored annually following the rainy season for indications of slope instability or erosion.

6.3 WATER MONITORING

Water monitoring activities will be conducted as part of the O&M plan for the Site, as required by the DTSC. Locations of water monitoring activities are shown on Figure 6-1.

In order to assure the effectiveness of the remedial actions, long-term water monitoring at the Site will be implemented (groundwater, surface water, subdrain water, and seeps). Groundwater will be monitored at the property boundaries at the southeast and northwest ends of the North Valley and southeast of the McAllister Drive Land Bridge (center of the valley) and at the outlet of the small tributary swale that enters the South Valley from the north. An existing shallow monitoring well, MW-12 will be used for future monitoring of the alluvium/colluvium in groundwater. A new groundwater monitoring well will be installed east of MW-12 that will monitor the alluvium groundwater and the deeper zone. Subdrain water will be sampled at both ends of the North Valley (southeast and northwest) at the toe of the fill slopes.

Surface water will be monitored at a station located northwest of the McAllister Drive Land Bridge. The two existing seeps will be monitored in the South Valley. All chemicals that were detected previously in samples taken from surface water, groundwater, or seeps during the RI will be monitored. The subdrains to be installed in the North Valley will be monitored at their outlets at either end of the North Valley.

The RI/FS (RI/FS; Earth Tech, 2001a) concluded that was little or no to groundwater at the project Site. Ingestion of groundwater is not considered a complete exposure pathway. Shallow groundwater at the Project Site is not currently used for any purpose, and is not expected to be used in the foreseeable future due to limited groundwater occurrence and low formation permeability that does not yield sufficient quantities of water for drinking or irrigation purposes. The RI/FS concluded that surface water in the South Valley is not impacted.

The following sections outline the monitoring of groundwater, surface water, subdrain water, and seeps.

6.3.1 Groundwater Monitoring

Groundwater will be monitored for five years. Monitoring will be conducted based on a quarterly monitoring schedule during the first year, then on a semiannual schedule during the following four years.

Groundwater will be monitored in the alluvium (shallow sediments) and in the bedrock in three locations. The locations of proposed groundwater monitoring wells are shown on Figure 6-1. Groundwater monitoring wells will be installed using the hollow-stem auger or mud rotary drilling methods. Installation will generally occur prior to the remediation of chemically affected soil.

Shallow groundwater monitoring wells will be constructed as single-cased wells and will be drilled and installed using the hollow-stem auger drilling method. Deeper groundwater monitoring wells will be constructed as double-cased wells.

6.3.1.1 Monitoring Well Inspections and Maintenance

Maintenance of the monitoring wells will be performed as needed, based on quarterly and semiannual inspections conducted during routine monitoring events. The following items will be checked during inspections:

- structural integrity of well boxes and stovepipes;
- security of well boxes and stovepipes (locks and caps installed and functioning properly);
- proper drainage of well boxes and stovepipes so that excess surface water does not accumulate inside;
- condition of well casing; and
- total depth of wells.

Any of the above items that require corrective maintenance, or significant changes in the total depth of the wells will be reported to the Project Coordinator and/or the QA/QC officer, and corrective maintenance will be scheduled and performed. Field staff will routinely carry spare locks and well caps while performing scheduled monitoring activities, so these items can be immediately replaced if the ones previously installed are missing or defective.

O&M work may be modified if conditions or usage of the site change. Such changes will be documented through amendments to the O&M Plan.

6.3.2 Surface Water Monitoring

Surface water will be monitored in the South Valley wetlands at a location northwest of the McAllister Drive Land Bridge, as shown in Figure 6-1. Surface water will be monitored on a quarterly basis for one year. The results of surface water monitoring will be evaluated during the Five Year Review.

6.3.3 Subdrain Monitoring

Subdrain water will be monitored at the subdrain outlets, located at the southeast and northwest ends of the North Valley, as shown in Figure 6-1. Subdrain water will be monitored on an quarterly basis for one year and a semi-annual basis for an additional four years. The FSLP describes the subdrain water monitoring procedures, analyses, and schedule in detail.

6.3.4 Seep Monitoring

Two existing seeps in the South Valley will be monitored at the locations shown on Figure 6-1. Seeps will be monitored on a quarterly basis for one year and a semi-annual basis for an additional four years. The results of seep monitoring will be evaluated annually for five years during the Five Year Review.

6.4 REPORT PREPARATION AND EFFECTIVENESS EVALUATION

The results of operation and maintenance activities will be evaluated annually for five years during the Five Year Review. The reports will include figures, laboratory data sheets, and recommendations for changes to the O&M activities, if necessary. The reports will be submitted to the DTSC and other agencies within 3 months of conducting the sampling event.

7.0 PROJECT SCHEDULE

The anticipated project schedule is shown on Figure 7-1. Field construction activities will begin after receiving regulatory approvals and permits. The projected start date for Non-OE remediation activities is March 2002, beginning with the post point clearance investigation areas. The site-wide post-remediation human health and ecological risk assessment is anticipated to begin in July 2002. The Non-OE remediation and post-remediation risk assessment activities are anticipated to require approximately 210 days to complete, and are projected for completion in January 2003. Because implementation of non-OE remediation activities is contingent on the schedule for OE remediation activities, adjustment to the project schedule may be required based on the progress of the OE clearance activities.

8.0 REFERENCES

Earth Tech 2000. Non-Ordnance and Explosives Remedial Investigation (RI)/Feasibility Study (FS) Work Plan, Tourtelot Cleanup Project, Benicia, California. February 15.

_____ 2001a. Revised Final Remedial Investigation/Feasibility Study Report, Tourtelot Cleanup Project, Benicia, California. July 12.

_____ 2001b. Administrative Draft Remedial Action Plan, Tourtelot Cleanup Project, Benicia, California. June 12.

_____ 2001c. Ordnance & Explosives Remedial Design Document, Tourtelot Cleanup Project, Benicia, California. June 13.

_____ 2001d, Site-Specific Safety and Health Plan, April 17, revised by Addendum 1, May 25.

_____ 2001e. Administrative Draft Environmental Impact Report, Tourtelot Remediation, Benicia, California. June 1st.

_____ 2001. Final Draft Ordnance and Explosives Remedial Design Document, Tourtelot Project Site, Benicia, California. July 24.

U.S. Army Corps of Engineers 1994a, Archives Search Report (ASR) Findings, Benicia Arsenal, Benicia, California. March.

_____ 1997, Supplement to the March Archives Search Report (ASR) for Benicia Arsenal, Benicia, California.

_____ 1997, Environmental Assessment, Benicia Arsenal Site Investigation, Benicia, California.

_____ and Support Center 2000, Final Engineering Evaluation/Cost Analysis, Former Benicia Arsenal, Benicia, California.

California Regional Water Quality Control Board, San Francisco Bay Region, Tri-Regional Board Staff Recommendations for Preliminary Evaluation and Investigation of Underground Tank Sites, August 10, 1990.

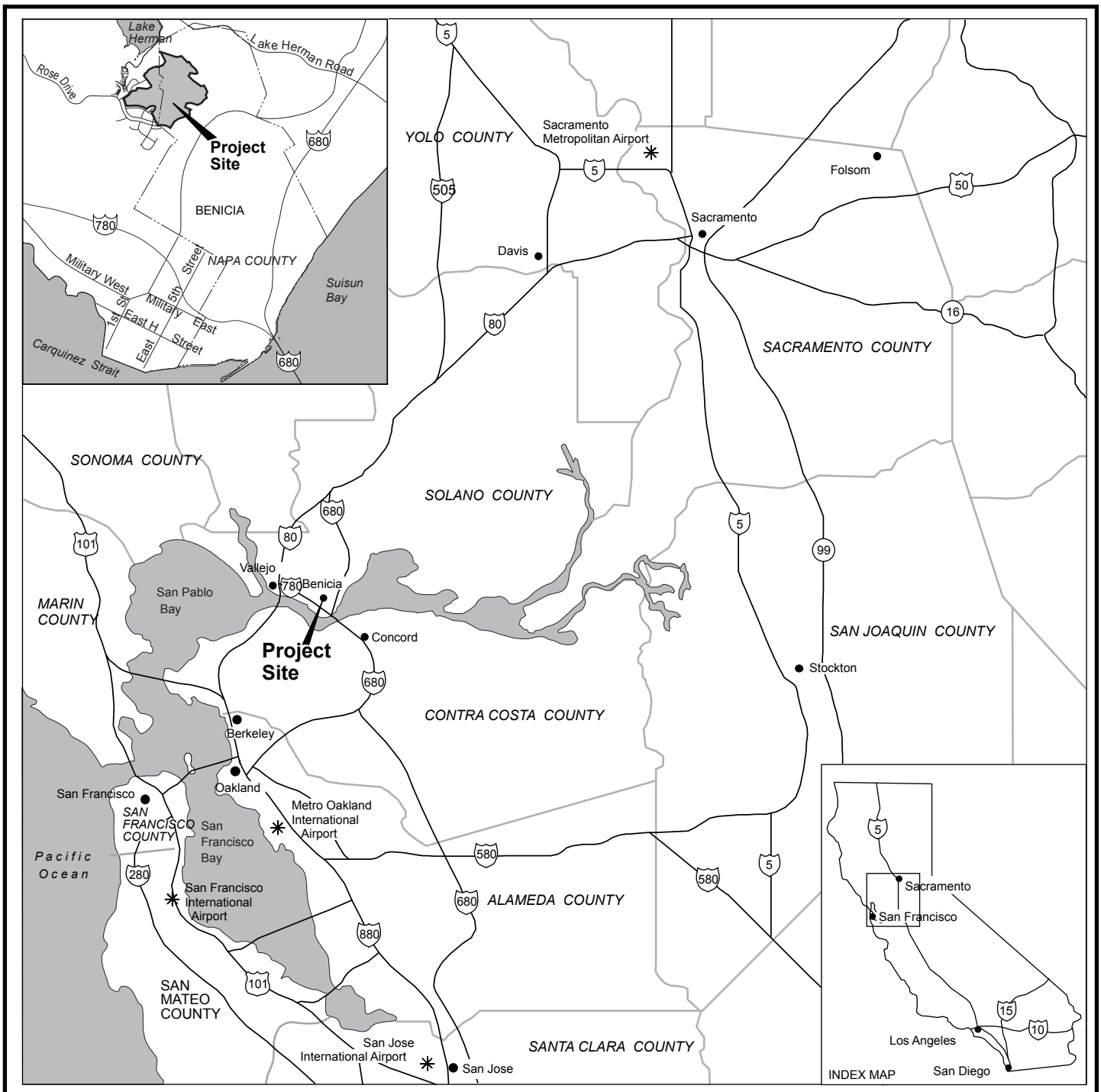
Jacobs Engineering 1999, Final Benicia Arsenal Records Research Report (RRR).

CERCLA - 42 U.S. Code (U.S.C), 9601 et seq. The Comprehensive Environmental Response, Compensation, and Liability Act.

NCP, 40 Code of Federal Regulations (CFR) part 300. The National Hazardous Oil and Substance Pollution Contingency Plan.

Docket No. I/SE 98/99-011, 1999. Imminent and/or Substantial Endangerment Determination and Remedial Action Order. June.

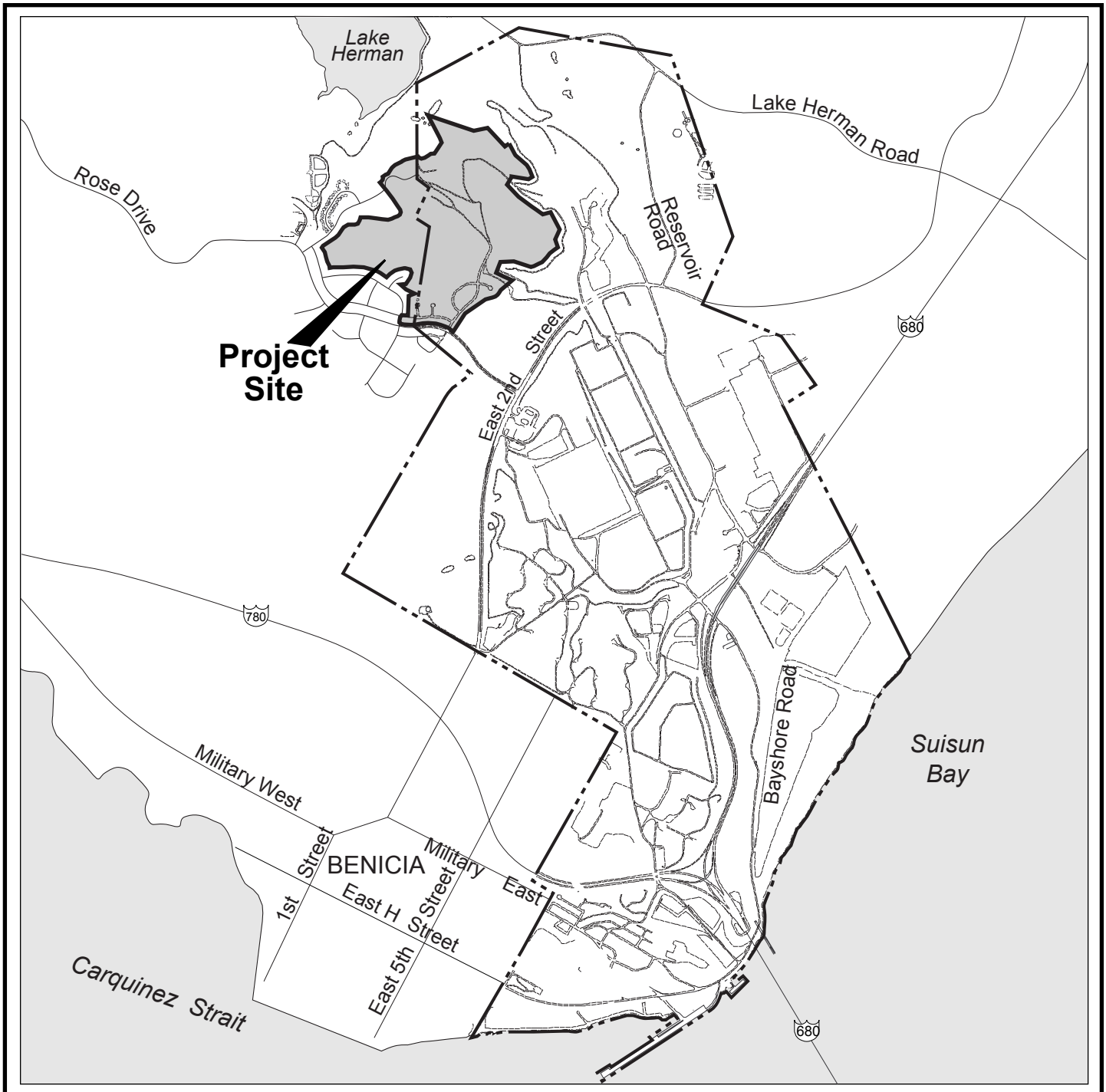
Health and Safety Code Section 25300 et seq.



Source: Final Draft Tourtelot Project Site Ordinance and Explosives Remedial Design Document. Earth Tech 2001

northgate environmental management, inc.

Figure 1-1
Regional Site Location
Tourtelot Cleanup Project, Benicia, California
June 2001



EXPLANATION

680 Interstate Highway

Former Benicia Arsenal Boundary (estimated)

Project Site

N

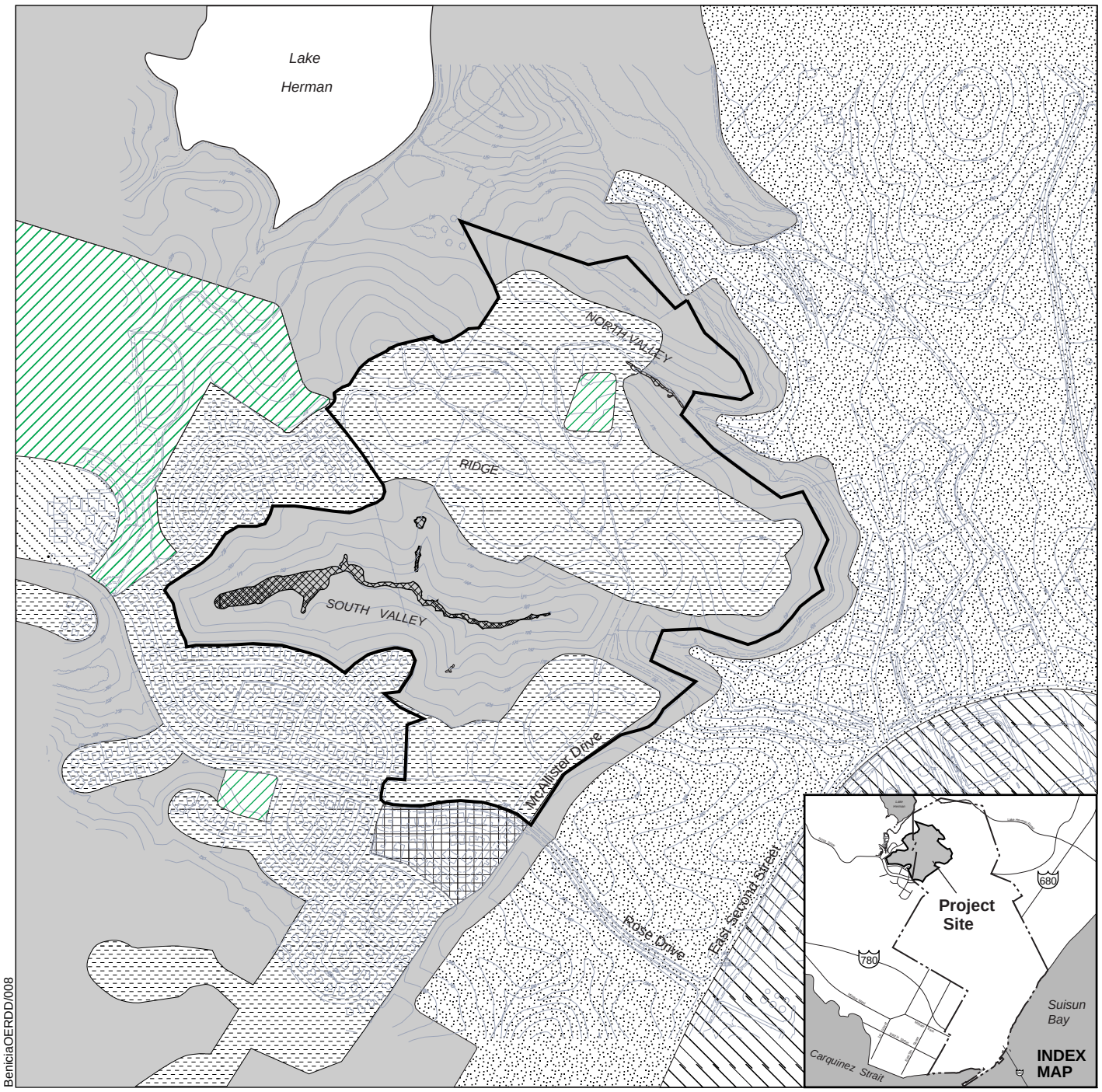
0 0.5

SCALE IN MILES

Source: Final Draft Tourtelot Project Site Ordinance and Explosives Remedial Design Document. Earth Tech 2001

northgate environmental management, inc.

Figure 1-2
Project Site Location
Tourtelot Cleanup Project, Benicia, California
June 2001



BeniciaOERDD/008

EXPLANATION

- Single Family Residential
- General Open Space
- Parks
- Light Industrial
- School
- Medium Density Residential
- General Industrial
- Jurisdictional Wetlands
- Project Site Boundary

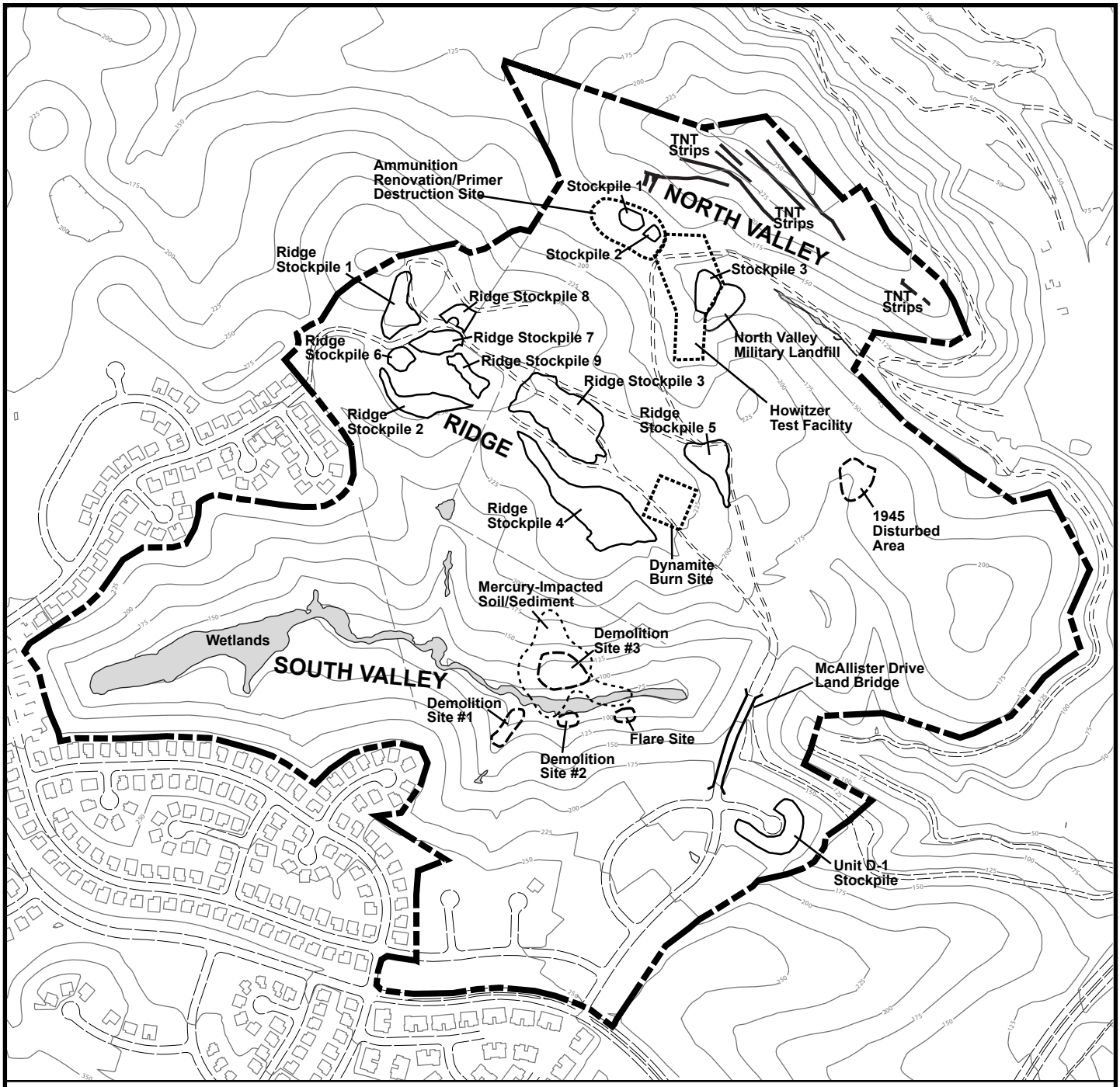
0 250 500 1000 Feet

Note: Contour interval equals 25 feet.

Future Land Use

Draft

Figure 1-3



Source: Final Draft Tourtelot Project Site Ordinance and Explosives Remedial Design Document. Earth Tech 2001

northgate environmental management, inc.

Figure 1-4
Historical Site Features
Tourtelot Cleanup Project, Benicia, California
August 2001

BeniciaOERDD/009

EXPLANATION

Project Site Boundary

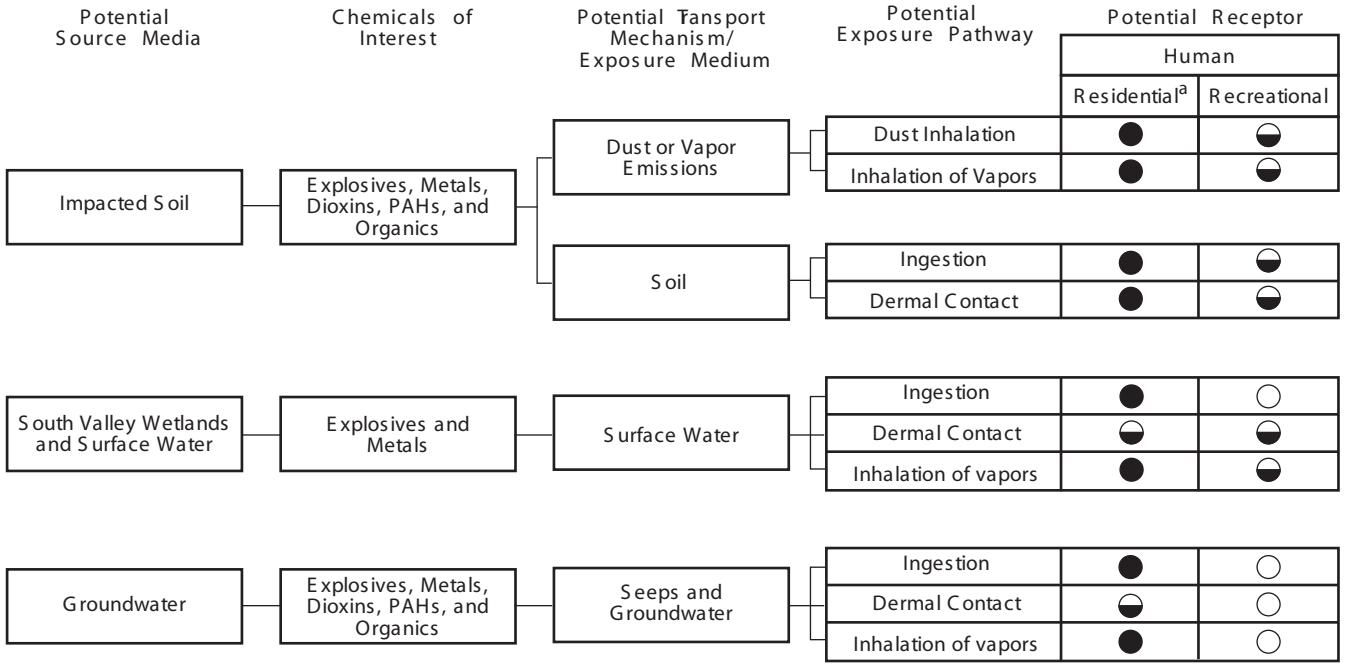
Jurisdictional Wetlands

0 250 500 1000 Feet

Jurisdictional Wetlands on Project Site

Draft

Figure 1-5



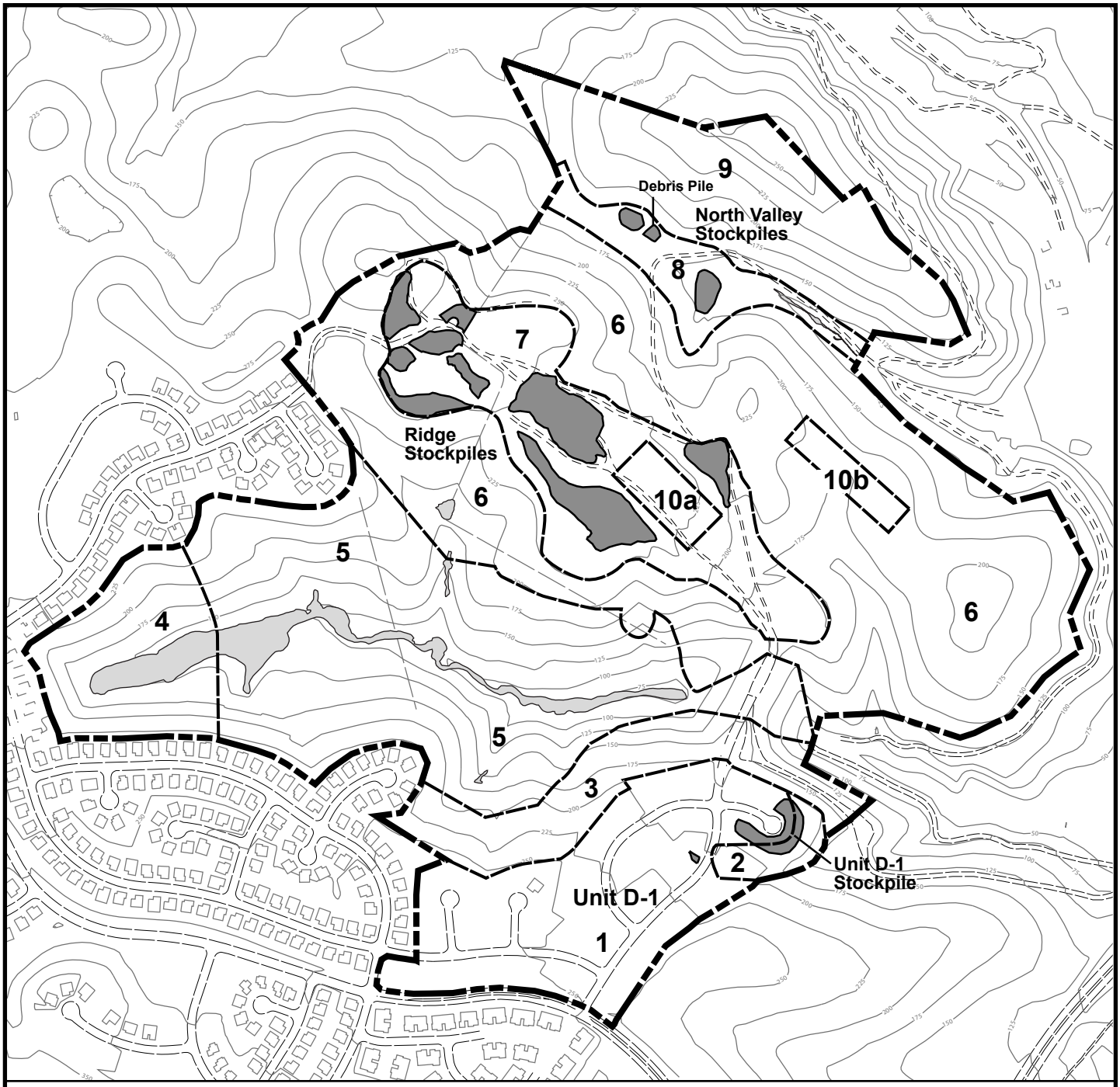
LEGEND

- ● Evaluated quantitatively in risk assessment
- ◒ Evaluated qualitatively in risk assessment
- ○ No complete exposure pathway

[a] Does not consider layer of clean fill that will be placed in residential areas (14 feet in most areas)

northgate environmental management, inc.

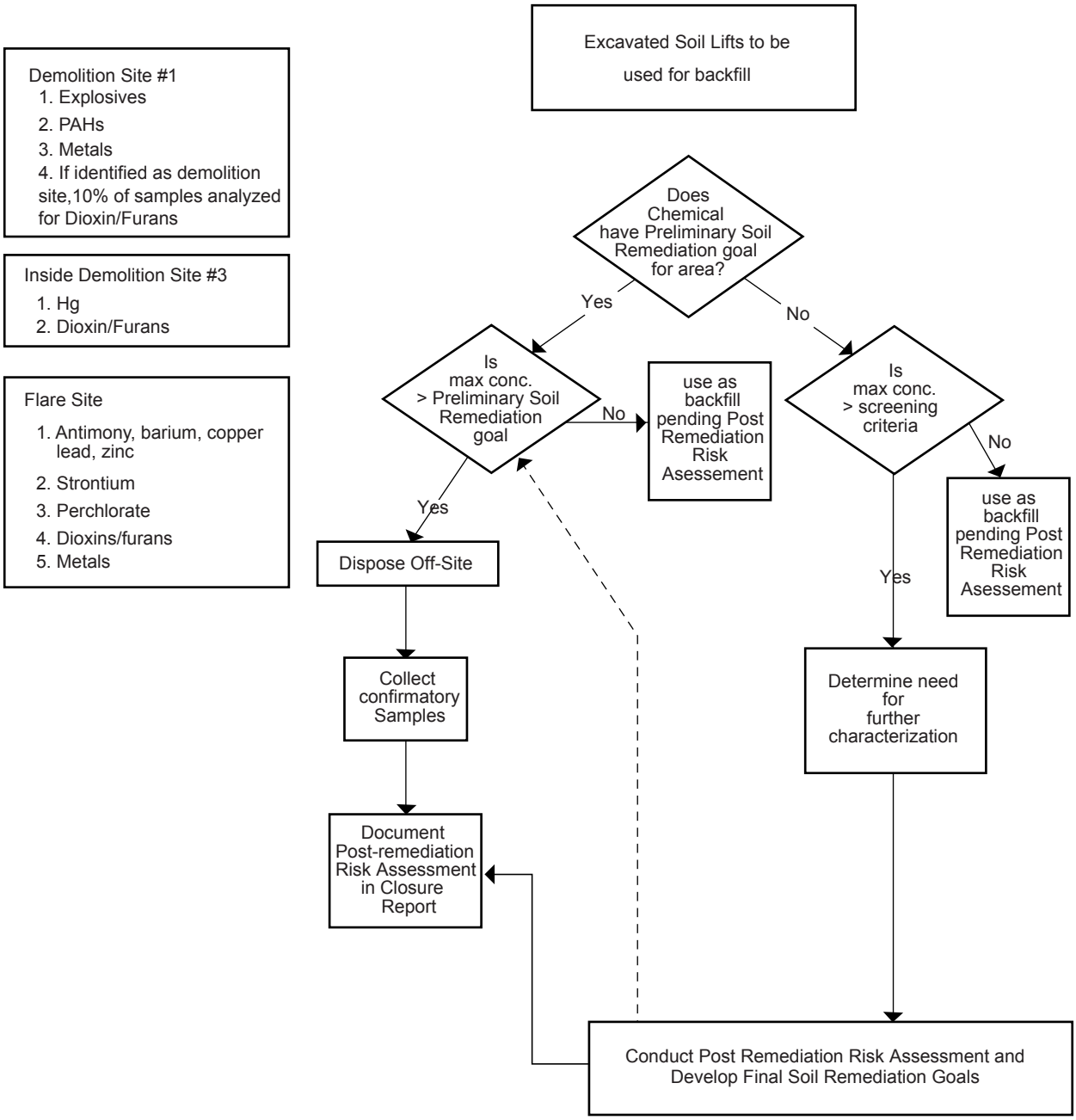
Figure 1-6
Conceptual Site Model for Chemically Impacted Media
Tourtelot Cleanup Project, Benicia, California
August 2001



Source: Final Draft Tourtelot Project Site Ordinance and Explosives Remedial Design Document. Earth Tech 2001

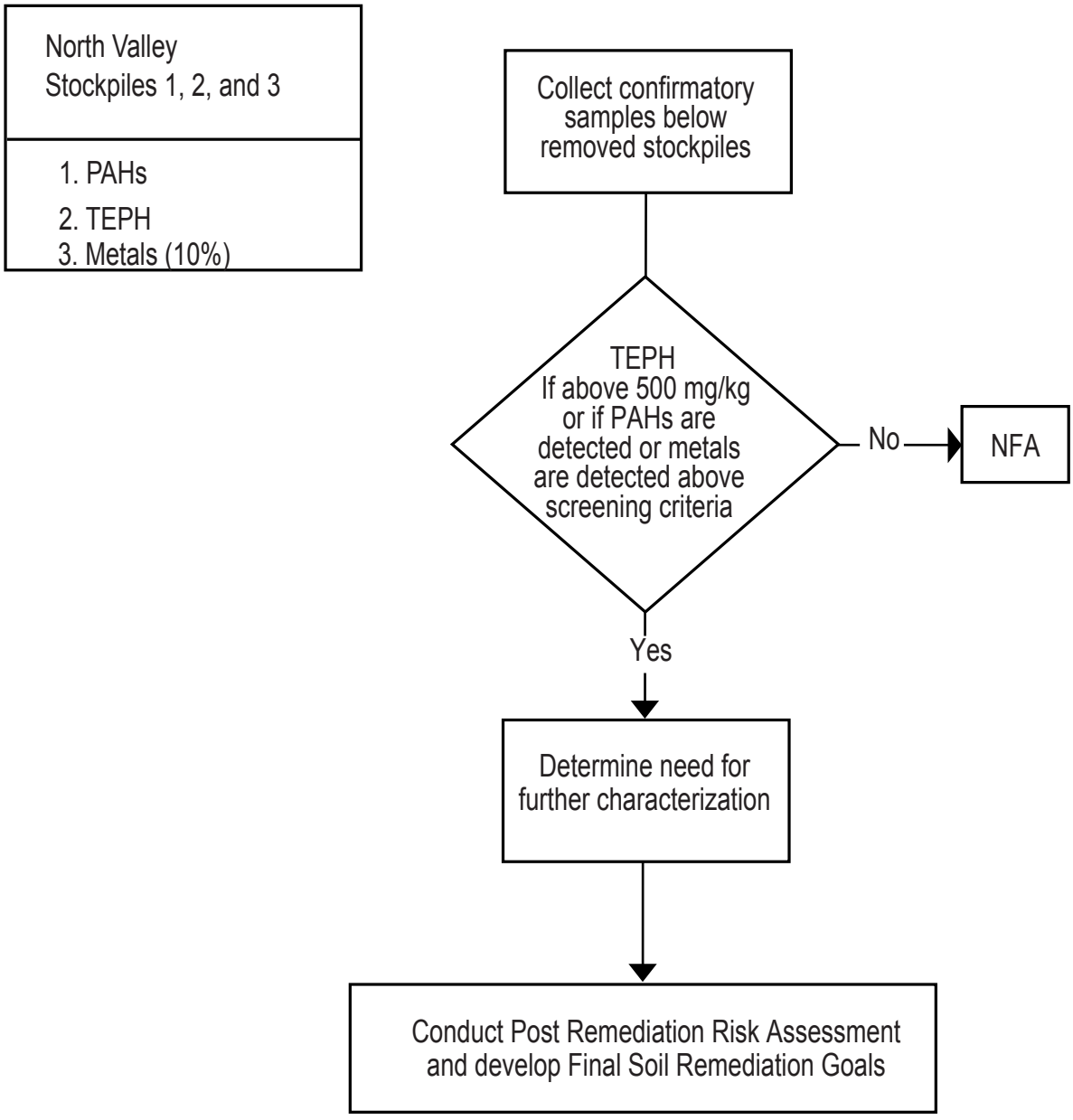
northgate environmental management, inc.

Figure 3-1
Soil Stockpiles in Project Site Sectors
Tourtelot Cleanup Project, Benicia, California
June 2001



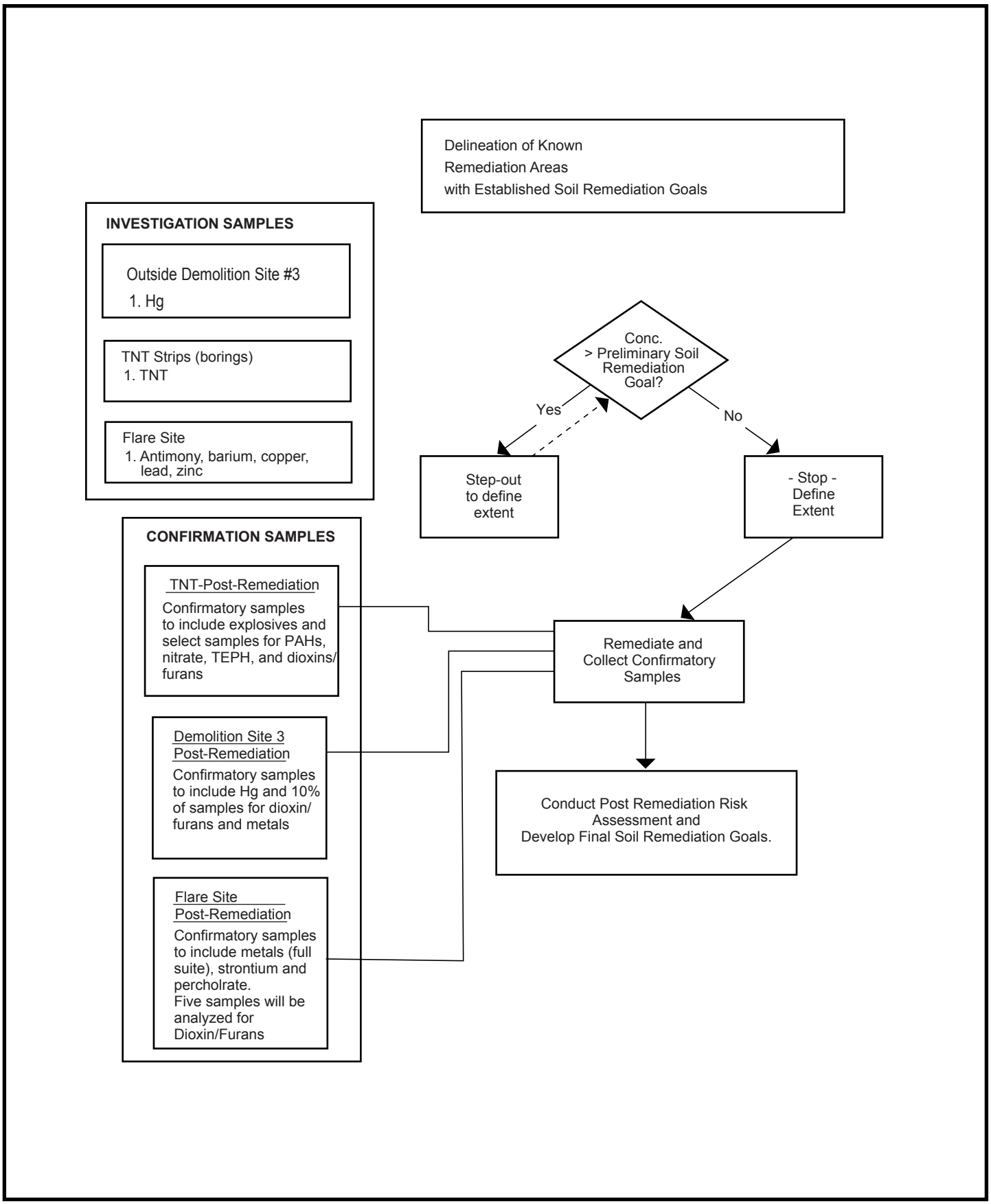
Attachment A - Figure A-3
Excavated Soil Lifts
Demolition Site #1, Inside
Demolition Site #3, and Flare Site
PROCESS FLOWCHART
Tourtelot Cleanup Project, Benicia, California. August 2001

northgate environmental management, inc.



northgate environmental management, inc.

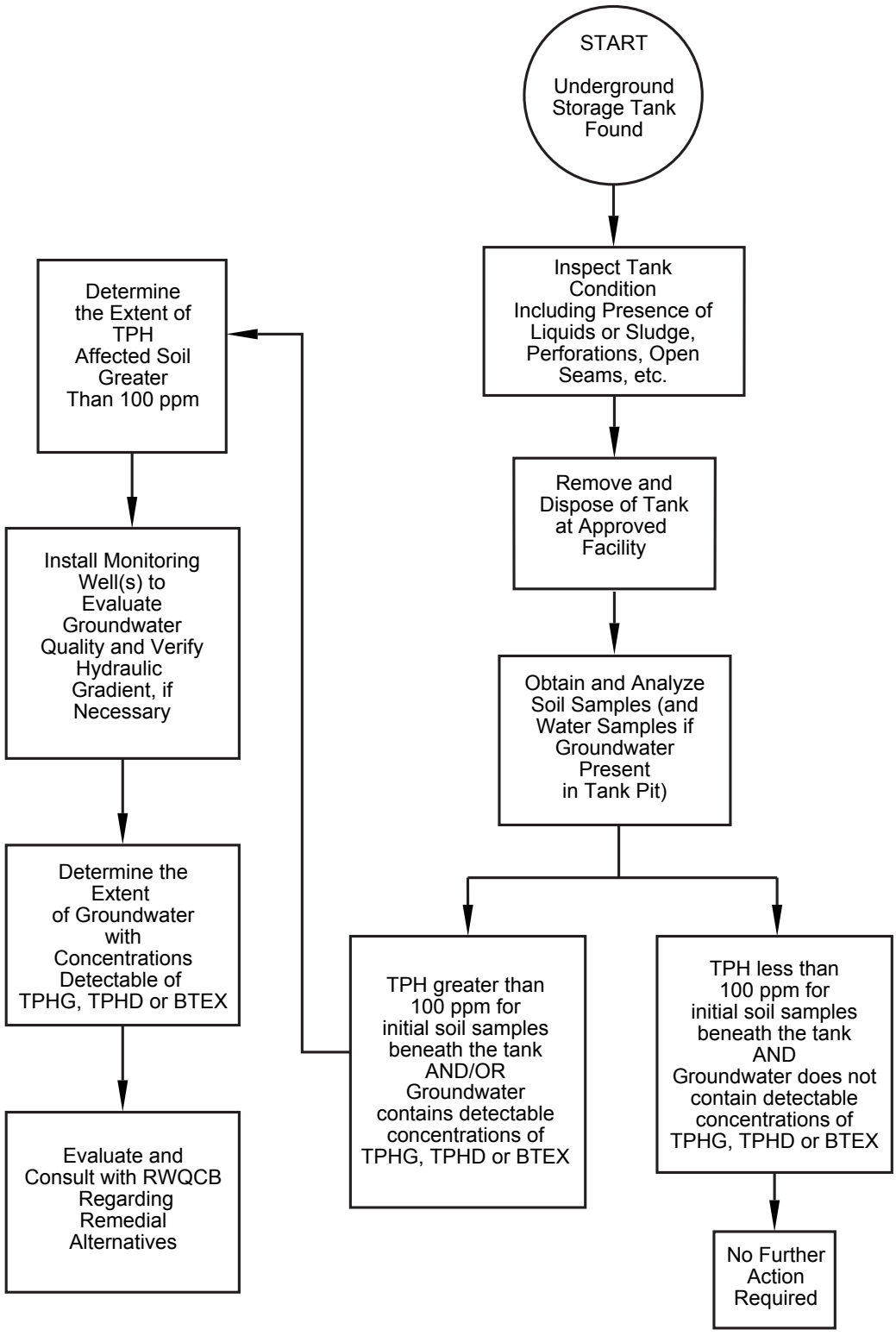
Attachment A - Figure A-2
North Valley Stockpiles 1, 2 and 3
PROCESS FLOWCHART
Tourtelot Cleanup Project, Benicia, California. August 2001



Attachment A - Figure A-1
Outside Demolition Site #3
TNT Strips, Flare Site
PROCESS FLOWCHART

Tourtelot Cleanup Project, Benicia, California. August 2001

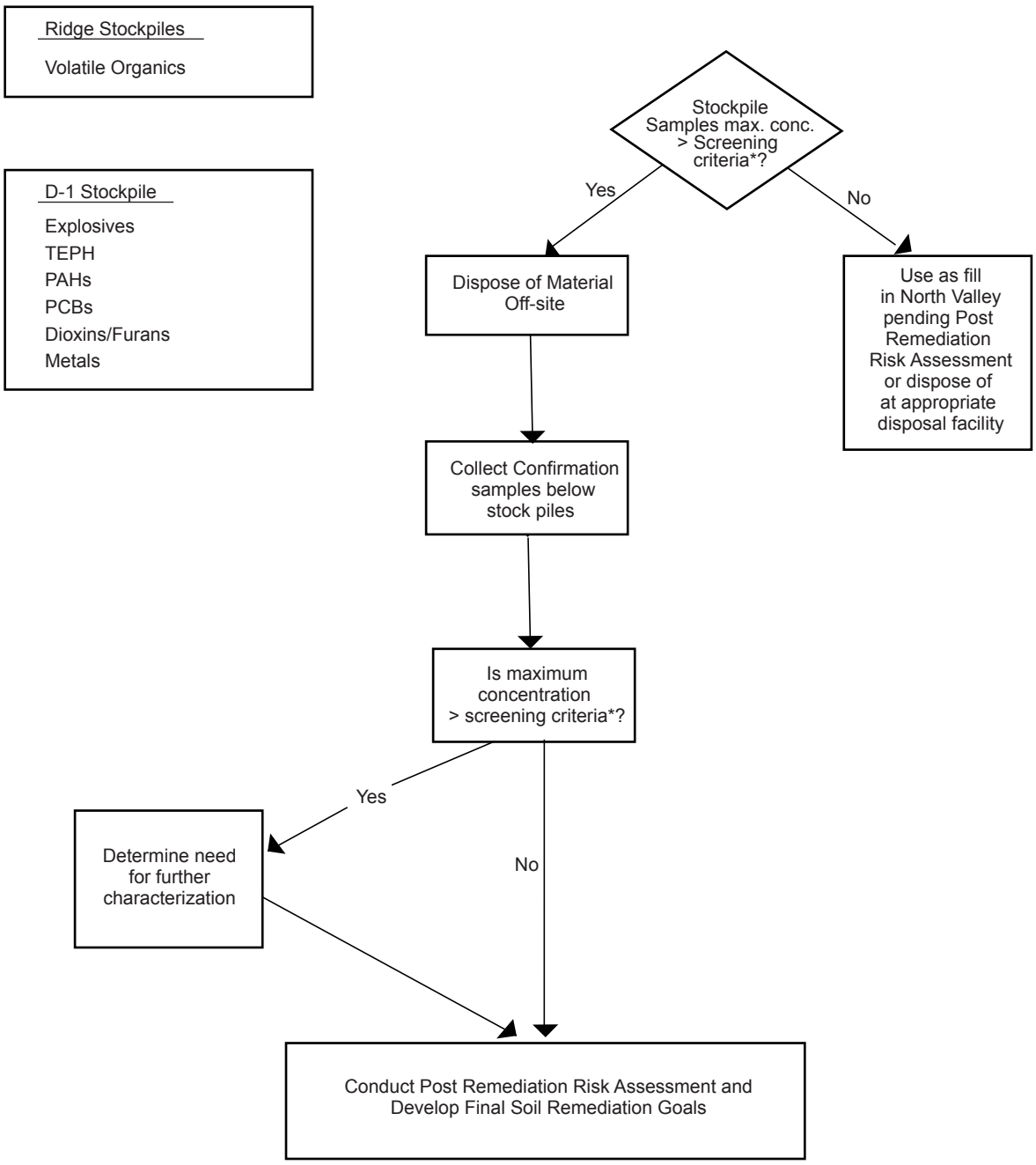
northgate environmental management, inc.



northgate environmental management, inc.

Attachment A - Figure A-4
Underground Storage Tank
PROCESS FLOWCHART

Tourtelot Cleanup Project, Benicia, California. August 2001



* Lower of preliminary remediation goals or screening criteria

northgate environmental management, inc.

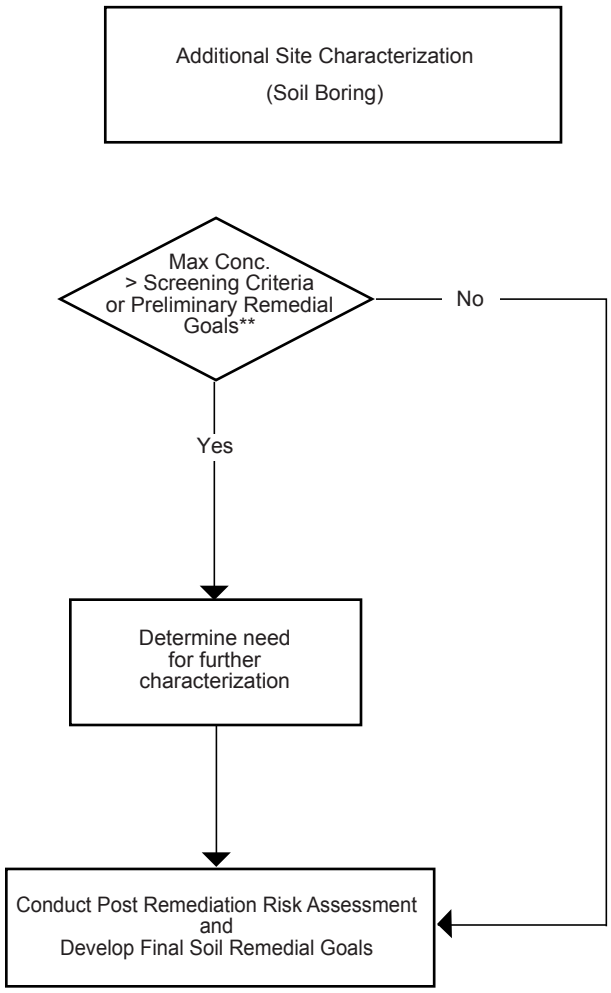
Attachment A - Figure A-5
Ridge Stockpiles
D-1 Stockpiles
PROCESS FLOWCHART
Tourtelot Cleanup Project, Benicia, California. August 2001

McAllister Drive Land Bridge
1. Explosives
2. PAHs
3. PCBs
4. TEPHd
5. Dioxins/furans

1945 Disturbed Area
1. Explosives
2. Metals
3. PAHs
4. PCBs
5. TEPHd and motor oil- not in Risk Assessment
6. Nitrate
7. Perchlorate
8. Phosphorous
9. Dioxin/Furans*

Downgradient Dynamite Burn - site
1. Explosives
2. PAHs
3. PCBs
4. TEPHd and motor oil - not in Risk Assessment
5. Dioxins/Furans

North Valley Hydrocarbon-Impacted Soil
1. TEPHd and motor oil - not in Risk Assessment (500 mg/kg)



* If evidence of burning found

** Lower of preliminary remediation goals or screening criteria

Attachment A - Figure A-6
McAllister Drive Land Bridge
1945 Disturbed Area
Downgradiant of Dynamite Burn Area
North Valley Hydrocarbon-Impacted Soil
PROCESS FLOWCHART
Tourtelot Cleanup Project, Benicia, California. August 2001

northgate environmental management, inc.

Explanation

- Project Site Boundary
- Wetlands
- TNT Strips
- Demolition/Flare Sites
- Extent of Mercury-Impacted Soil/Sediment
- Stockpiles

Planimetric features

- Buildings
- Foundations
- Roads/Trails
- 25 Foot Contour

Sectors

1, 2, 3, 4, 5, 6, 7, 8, 9, 10a, 10b

/2714/data/cityofbenicia/arcview/projects/rdd1.apr(Figure 2-1RDD March 2001)

Administrative Draft

N

150 0 150 300 450 600 Feet

FIGURE 2 - 1

Project Site Sectors

Tourtelot Cleanup Project
Benicia, California

March 2001

Table 2-2
Summary of Remediation and Planned Supplemental Non-OE Investigation after OE Point Clearance
Tourtelot Cleanup Project, Benicia, California

Area of Interest	Outstanding Issue	When Issue is to be Addressed	Document that will present Scope of Work	Chemicals to be Considered
TNT Strips	Lateral and vertical extent of explosives impact associated with TNT Strips (including possible 6th strip identified during the updated aerial photographic review between TNT Strip #3 and #4).	During remediation through excavation confirmation sampling.	Details of excavation confirmation sampling plan will be presented in non-OE RDD.	Explosives.
	Lateral extent of explosives impact to east beyond the Project Site boundary.	During remediation through excavation confirmation sampling.	Details of excavation confirmation sampling plan will be presented in non-OE RDD.	Explosives.
	Lateral and vertical extent of contamination between TNT Strip #4 and sample location TNT-R6.	During remediation through excavation confirmation sampling.	Details of excavation confirmation sampling plan will be presented in non-OE RDD.	Explosives.
	Lateral and vertical extent of petroleum hydrocarbons, nitrates, PAHs, and dioxins/furans.	During remediation of TNT Strips through excavation confirmation sampling.	Details of excavation confirmation sampling plan will be presented in non-OE RDD.	Ten percent of the confirmation samples will be analyzed for TEPHs, nitrates, and PAHs. Two samples per strip will be analyzed for dioxins/furans.
Howitzer Test Facility Stockpile #3	Off-site disposal of stockpile material. Vertical extent of stockpile material.	During remediation through additional sampling of stockpile material at a frequency required by the disposal facility and confirmation beneath stockpile after removal.	Details of stockpile and confirmation sampling plan will be presented in non-OE RDD.	Supplemental stockpile analyses to be determined by the disposal facility. Confirmation sampling beneath stockpile for chemicals identified in the stockpiles (TEPH and PAHs). Ten percent of the confirmation samples will also be analyzed for full suite of metals.
Ammunition Renovation/Primer Destruction Site	Removal of possible UST (point source)	Geophysical anomaly will be investigated as part of site-wide OE point clearance.	Details of site-wide OE point clearance will be presented in OE RDD.	TEPHs as Diesel and gasoline and BTEX

Table 2-2
Summary of Remediation and Planned Supplemental Non-OE Investigation after OE Point Clearance
Tourtelot Cleanup Project, Benicia, California

Area of Interest	Outstanding Issue	When Issue is to be Addressed	Document that will present Scope of Work	Chemicals to be Considered
			Area of the geophysical anomaly will be excavated to determine the existence of an UST. If an UST is identified, it will be removed in accordance with the Regional Water Quality Control Board guidelines. Additional investigation will be performed including soil boreholes or installation of monitoring wells, if conditions warrant. Overexcavation will be conducted as necessary to achieve RAOs, and confirmation sampling performed in accordance with UST removal guidelines.	Details of UST removal procedures and excavation confirmation sampling plan will be presented in non-OE RDD.
Ammunition Renovation/Primer Destruction Site Stockpile #1 and #2	Off-site disposal of stockpile material. Vertical extent of stockpile material.	During remediation through additional sampling of stockpile material at a frequency required by the disposal facility and confirmation sampling beneath stockpile after removal.	Details of stockpile and confirmation sampling plan will be presented in non-OE RDD.	Supplemental stockpile material analyses to be determined by the disposal facility. Confirmation sampling beneath stockpile for chemicals identified in the stockpiles (TEPHs and PAHs). Ten percent of the confirmation samples will also be analyzed for a full suite of metals.
North Valley - General	Extent of non-point-source petroleum hydrocarbon impact to soil in North Valley.	After OE point clearance. Additional soil boreholes to further define lateral extent of non-point-source petroleum hydrocarbons.	Details of sampling plan will be presented in non-OE RDD.	TEPHs.
Ridge Area Stockpiles 1 through 9	Determine presence of VOCs.	During remediation through field screening techniques.	Details of soil sampling plan will be presented in non-OE RDD.	VOCs.

Table 2-2
Summary of Remediation and Planned Supplemental Non-OE Investigation after OE Point Clearance
Tourtelot Cleanup Project, Benicia, California

Area of Interest	Outstanding Issue	When Issue is to be Addressed	Document that will present Scope of Work	Chemicals to be Considered
Downgradient Areas from Dynamite Burn Site	Downgradient soil quality has not been investigated.	During remediation through soil sampling which will include soil downgradient in the North Valley and the drainage swale northeast of the McAllister Drive Land Bridge.	Details of soil sampling plan will be presented in non-OE RDD.	Explosives, TEPH, PAHs, PCBs, and one Dioxins/Furans sample per boring.
Flare Site	Vertical and lateral extent of metals and dioxins/furans.	Additional soil sampling to define vertical and lateral extent during remediation and through soil boreholes and excavation confirmation sampling.	Details of soil sampling and excavation confirmation sampling plan will be presented in non-OE RDD.	Metals (antimony, barium, copper, lead, zinc). The confirmation samples will be analyzed for a full suite of metals (including strontium) and perchlorate. Five confirmation samples will be analyzed for Dioxins/Furans.
Demolition Site #1	Site not fully investigated due to presence of a geophysical anomalies.	After anomaly removal, additional sampling will be performed at the demolition site.	Details of sampling plan will be presented in non-OE RDD.	Explosives, PAHs, Metals. If Demolition Site #1 is identified as a demolition site, ten percent of the confirmation samples will be analyzed for Dioxins/Furans.
Demolition Site #3	Vertical and lateral extent of mercury impact.	Additional soil sampling to define vertical and lateral extent during remediation and through and excavation confirmation sampling.	Details of soil sampling and excavation confirmation sampling plan will be presented in non-OE RDD.	Mercury. Ten percent of confirmation samples will be analyzed for Dioxins/Furans and metals.
McAllister Drive Land Bridge	Additional sampling for compounds of interest possibly associated with a mobile communications tower previously situated in the borrow area. In addition, TNT will be added to the list of explosives analysis.	After OE point clearance.	Details of sampling plan will be presented in non-OE RDD.	Explosives (including TNT), TEPH, PAHs, PCBs, Dioxins/Furans.
1945 Disturbed Area on Ridge northeast of McAllister Drive Land Bridge	Assessment of disturbed area.	After OE point clearance.	Details of sampling plan will be presented in non-OE RDD.	All chemicals previously identified for the Tourtelot Remediation Project.

Table 2-2
Summary of Remediation and Planned Supplemental Non-OE Investigation after OE Point Clearance
Tourtelot Cleanup Project, Benicia, California

Area of Interest	Outstanding Issue	When Issue is to be Addressed	Document that will present Scope of Work	Chemicals to be Considered
Unit D-1 Stockpile	Characterize Unit D-1 area soil stockpile. Off-site disposal if contaminated; use for backfill if below RAOs. If contaminated, collect confirmatory samples below stockpile.	After OE point clearance.	Details of stockpile sampling and confirmation sampling will be presented in non-OE RDD.	Explosives, TEPH, PAHs, PCBs, Dioxins/Furans (if evidence of burning), Metals (entire suite). Confirmation samples will be analyzed for chemicals defined during characterization.
North Valley and South Valley Groundwater/Seeps & Surface Water	Need for further groundwater data.	After OE point clearance. Additional groundwater monitoring wells will be installed outside the construction area to create well pairs monitoring the alluvium/ colluvium and weathered bedrock, respectively, at the west and east ends of the North Valley and either adjacent to, or downgradient of, well MW-12 in the South Valley, depending on the results of the drainage swale sampling northeast of the McAllister Drive Land Bridge.	Monitoring will include sampling North Valley and South Valley groundwater, North Valley seeps and subdrain, and South Valley surface water. Groundwater/ seep/subdrain monitoring will be conducted on a quarterly basis for a period of 1 year and on a semiannual basis for an additional four years. Surface water monitoring will be conducted on a quarterly basis for a period of one year. Specific details of the monitoring program will be presented in non-OE RDD.	All chemicals detected with concentrations above upgradient levels in either the groundwater or seeps at the Project Site will be analyzed.
Site-wide	Human health risk assessment and ecological risk assessment.	After OE point clearance, non-OE remediation, and prior to backfilling of the remediated areas.	Chapter 7.0 of RI/FS with specific details presented in non-OE RDD.	Human health and ecological risks will be assessed for all chemical constituents analyzed for in confirmation sampling, as well as analytical results for other areas where soil will remain in place.

Table 2-2
Summary of Remediation and Planned Supplemental Non-OE Investigation after OE Point Clearance
Tourtelot Cleanup Project, Benicia, California

Area of Interest	Outstanding Issue	When Issue is to be Addressed	Document that will present Scope of Work	Chemicals to be Considered

DNT = dinitrotoluene
MW = monitoring well
OE = ordnance and explosives
PAH = polynuclear aromatic hydrocarbon
PCB = polychlorinated biphenyl
RDD = remedial design document
RI/FS = remedial investigation/feasibility study
SVOC = semivolatile organic compound
TEPH = total extractable petroleum hydrocarbons
TNT = trinitrotoluene
UST = underground storage tank

Table 2-1
Project Site Sector Description and Relevance to Non OE Investigation & Remediation
Tourtelot Cleanup Project
Benicia, California

Sector	Description	Non OE Remediation Area(s)		Non OE Investigation Area(s)	
1	Unit D-1				
2	Fill area in Unit D-1				
3	The Portions of the South Valley within 200 feet of Unit D-1 boundary			X	McAllister Drive Land Bridge
4	The portion of the South Valley that is within 1,181 feet of Mathew Turner Elementary School (maximum fragmentation distance of 37mm HE projectile)				
5	The remainder of the South Valley outside the limits of construction. This sector includes Demolition Sites #1 and #3, the Flare Site and a portion of the McAllister Drive Land Bridge	X	Demo Site # 3, Flare Site	X	Demo Site # 1, McAllister Drive Land Bridge
6	Relatively undisturbed portions of the Ridge and South Valley within the limits of construction for residential development			X	Downslope Areas from the Dynamite burn
7	The Ridge that has been previously excavated to bedrock			X	Ridge Stockpiles
8	The bottom of the North Valley as defined by the maximum extent of alluvial and/or fill materials	X	North Valley Stockpiles	X	Petroleum Hydrocarbon North Valley
9	The north slope of the North Valley including the TNT Strips and estimated maximum extent of TNT affected soils.	X	TNT strips and other TNT affected soils		
10A	Soils borrow area for fill in Unit D-1				
10B	Field verification of geophysical performance evaluation and stockpile area on the Ridge for the fill soils or soils that were temporarily removed for point or areawide clearance			X	1945 Disturbed

Note: Approximate sector boundaries are shown on Figure 2-1

Table 2-4a
HUMAN HEALTH SCREENING CRITERIA
Tourtelot Cleanup Project

ANALYTE	US EPA Region 9 Residential PRGs (mg/kg)		Analytical Methods	95th percentile of Ambient Soil Samples (mg/kg)
METALS				
aluminum	76,000	nc	6010 B	27,535
antimony	31	nc		2.31
arsenic	0.39	ca		18.2
barium	5,400	nc		448
beryllium	150	nc		0.82
cadmium	9	ca		1.4
chromium, total	210	ca		63
cobalt	4,700	nc		23.1
copper	2,900	nc		71.7
iron	23,000	nc		43,805
lead	400	nc		69.9
manganese	1,800	nc		1,645
molybdenum	390	nc		NA
nickel	150	ca		65
selenium	390	nc		0.85
silver	390	nc		NA
thallium	5.2	nc		NA
vanadium	550	nc		96.4
zinc	23,000	nc		106
mercury	23	nc	7471	0.26
nitrogen, nitrate (as N)	130,000	nc		NA
nitrogen, nitrite (as N)	7,800	nc		NA
perchlorate	37	nc	300	NA
phosphorus, total (as P)	NA			458
Strontium	45000			NA
SVOCs				
bis(2-ethylhexyl) phthalate	35	ca	8270	NA
chrysene	6.1	ca		NA
dibenz(a,h)anthracene	0.062	ca		
fluoranthene	2,300	nc		NA
nitrobenzene	20	nc		NA
phenanthrene	22,000	nc		NA
PCBs				
PCB-1254 (Aroclor 1254)	0.22	ca	8082	NA
DIOXINS				
1,2,3,4,6,7,8-HpCDD	3.90E-04	ca	8290	NA
1,2,3,4,7,8-HxCDD	3.90E-05	ca		NA
1,2,3,6,7,8-HxCDD	3.90E-05	ca		NA
1,2,3,7,8,9-HxCDD	3.90E-05	ca		NA
1,2,3,7,8-PeCDD	7.80E-06	ca		NA
2,3,7,8-TCDD	3.90E-06	ca		NA
OCDD	3.90E-03	ca		NA

Table 2-4a
HUMAN HEALTH SCREENING CRITERIA
Tourtelot Cleanup Project

ANALYTE	US EPA Region 9 Residential PRGs (mg/kg)		Analytical Methods	95th percentile of Ambient Soil Samples (mg/kg)
FURANS				
1,2,3,4,6,7,8-HpCDF	3.90E-04	ca		NA
1,2,3,4,7,8,9-HpCDF	3.90E-04	ca		NA
1,2,3,4,7,8-HxCDF	3.90E-05	ca		NA
1,2,3,6,7,8-HxCDF	3.90E-05	ca		NA
1,2,3,7,8-PeCDF	7.80E-05	ca		NA
2,3,4,6,7,8-HxCDF	3.90E-05	ca		NA
2,3,4,7,8-PeCDF	7.80E-06	ca		NA
2,3,7,8-TCDF	3.90E-05	ca		NA
OCDF	3.90E-03	ca		NA
PAHs				
acenaphthene	2,600		8310	NA
anthracene	22,000	nc		NA
benzo(a)anthracene	0.62	ca		NA
benzo(a)pyrene	0.062	ca		NA
benzo(b)fluoranthene	0.62	ca		NA
benzo(g,h,i)perylene	2,300	nc		NA
benzo(k)fluoranthene	0.61	ca		NA
fluorene	1,800	nc		NA
indeno(1,2,3-c,d)pyrene	0.62	ca		NA
naphthalene	56	nc		NA
pyrene	2,300	nc		NA
EXPLOSIVES				
HMX				
Cyclonite (RDX)	4	ca		NA
1,3,5-trinitrobenzene	1,800	nc	8330	NA
1,3-dinitrobenzene	6.1	nc		NA
2,4,6-trinitrotoluene	16	ca		NA
2,4-dinitrotoluene	0.72	ca		NA
2,6-dinitrotoluene	0.02	ca		NA
2-amino-4,6-dinitrotoluene	16	ca		NA
2-nitrotoluene	370	nc		NA
3-nitrotoluene	370	nc		NA
4-amino-2,6-dinitrotoluene	16	ca		NA
4-nitrotoluene	370	nc		NA
tetryl	61	nc		NA
nitroglycerin	35	ca	8332	NA
VOCs*				
1,2,3-trichlorobenzene	650	nc	8260B	NA
1,2,4-trichlorobenzene	650	nc		NA
1,4-dichlorobenzene	3.4	ca		NA
2-butanone	7,300	nc		NA
acetone	1,600	nc		NA
benzene	0.65	ca		NA
ethylbenzene	230	nc		NA
hexachlorobutadiene	6.2	ca		NA

Table 2-4a
HUMAN HEALTH SCREENING CRITERIA
Tourtelot Cleanup Project

ANALYTE	US EPA Region 9 Residential PRGs (mg/kg)		Analytical Methods	95th percentile of Ambient Soil Samples (mg/kg)
methylene chloride	8.9	ca		NA
naphthalene	56	nc		NA
sec-butylbenzene	110	nc		NA
toluene	520	nc		NA
xylene (m,p)	210	nc		NA

ca = cancer risk screening criterion
nc = non-cancer risk screening criterion

Note:
*VOC screening levels based on Region IX PRGs or Cal Modified PRGs and presented for compounds detected to date. Screening criteria for additional detected compounds will also be based on Region IX PRGs or Cal Modified PRGs.

NA - not applicable

Table 2-3
Preliminary Soil Remediation Goals
Tourtelot Cleanup Project
Benicia, California

	Preliminary Remedial Goals	TNT Strips	Stockpiles #1, #2, #3	Flare Site	Demolition Site #3
METALS					
Antimony	2.84 mg/kg			✓	
Barium	642 mg/kg			✓	
Copper	87.7 mg/kg			✓	
Lead	148 mg/kg			✓	
Mercury	0.77 mg/kg				✓
Zinc	142 mg/kg			✓	
ORGANIC COMPOUNDS					
Dioxins	12 pg/g[(1)]			✓	
2,4,6-trinitrotoluene	16 mg/kg[(2)] (residential)	✓			

Table 2-3
Preliminary Soil Remediation Goals
Tourtelot Cleanup Project
Benicia, California

	Preliminary Remedial Goals	TNT Strips	Stockpiles #1, #2, #3	Flare Site	Demolition Site #3
2,4,6-trinitrotoluene	53 mg/kg[2] (recreational)	✓			
2,6-dinitrotoluene	0.5[3] mg/kg	✓			
Polynuclear Aromatic Hydrocarbons: benzo(a)pyrene & dibenz(a,h)anthracene	0.03 [3] mg/kg 0.05[3] mg/kg		✓		
Total Petroleum Hydrocarbons	500 mg/kg[4] (residential)		✓		

Notes:

[1] Dioxin concentrations are expressed in terms of 2,3,7,8-TCDD toxicity equivalence (TEQ)

[2] Individual remediation goals for all other explosives detected in soils have not been proposed. This decision is based on cumulative risks indicating that explosive compounds are likely to be below *de minimus* risk levels , if TNT and 2,6-DNT are removed to remedial goals.

[3] Goals are estimated Practical Quantitation Limit Values; because these are laboratory-specific numbers, they may change once the laboratory for the remedial action phase has been selected.

Table 4-1
Information Contacts
Tourtelot Cleanup Project
Benicia, California

Organization	Name of Contract	Address of Contact	Telephone Number of Contact
Granite Management Corporation	Jason Keadjian	938 Tyler Street, Suite 104 Benicia, CA 94510	Voice: (707) 745-2112 Fax: (707) 745-3675
U.S. Army Corps of Engineers	Bruce Handel	1325 J Street Sacramento, CA 95814	Voice: (916) 577-7906 Fax: (916) 577-7865
City of Benicia	Heather McLaughlin	250 East L. Street Benicia, CA 94510	Voice: (707) 745-2112 Fax: (707) 745-1196
Department of Toxic Substances Control (DTSC)	James Austreng	8800 Cal Center Drive Sacramento, CA 95826	Voice: (916) 255-3702 Fax: (916) 255-3794

Table 2-4b
ECOLOGICAL SCREENING CRITERIA
North Valley Grassland Area and Freshwater Marsh Wetland Area
TNT Strips, Flare Site, Demolition Site #1, and Demolition Site #3
Tourtelot Cleanup Project

ANALYTE	Ecological Screening Criteria (mg/kg)	Basis	95th percentile of Ambient Soil Samples (mg/kg)
METALS			
aluminum	27,535	Background	27,535
antimony	5	Plants	2.24
arsenic	60	Invertebrates	18
barium	500	Plants	419
beryllium	10	Plants	0.83
cadmium	4	Plants	1.52
chromium, total	240	Bird - Hawk	64.8
cobalt	220	Bird - Hawk	22.6
copper	100	Plants	71.8
iron	NA		43,805
lead	170	Bird - Hawk	78.8
manganese	16,000	Mammal - Deer	1645
molybdenum	2	Plants	NA
nickel	200	Invertebrates	65.5
selenium	3.2	Mammal - Deer	1.35
silver	2	Plants	0.38
thallium	4.2	Mammal - Deer	NA
vanadium	1,900	Bird - Hawk	101
zinc	200	Invertebrates	115
mercury	0.3	Plants	0.26
nitrogen, nitrate (as N)	160,000	Mammal - Deer	NA
perchlorate	TBD		
phosphorus, total (as P)	NA		458
Strontium	TBD		NA
DIOXINS			
1,2,3,4,6,7,8-HpCDD	0.032	Mammal - Deer	NA
1,2,3,4,7,8-HxCDD	0.0032	Mammal - Deer	NA
1,2,3,6,7,8-HxCDD	0.0032	Mammal - Deer	NA
1,2,3,7,8,9-HxCDD	0.0032	Mammal - Deer	NA
1,2,3,7,8-PeCDD	0.00031	Mammal - Deer	NA
2,3,7,8-TCDD	0.00031	Mammal - Deer	NA
OCDD	3.2	Mammal - Deer	NA
FURANS			
1,2,3,4,6,7,8-HpCDF	0.032	Mammal - Deer	NA
1,2,3,4,7,8,9-HpCDF	0.032	Mammal - Deer	NA
1,2,3,4,7,8-HxCDF	0.0032	Mammal - Deer	NA
1,2,3,6,7,8-HxCDF	0.0032	Mammal - Deer	NA
1,2,3,7,8-PeCDF	0.0064	Mammal - Deer	NA
2,3,4,6,7,8-HxCDF	0.0031	Mammal - Deer	NA
2,3,4,7,8-PeCDF	0.0006	Mammal - Deer	NA
2,3,7,8-TCDF	0.0016	Mammal - Deer	NA

Table 2-4b
ECOLOGICAL SCREENING CRITERIA
North Valley Grassland Area and Freshwater Marsh Wetland Area
TNT Strips, Flare Site, Demolition Site #1, and Demolition Site #3
Tourtelot Cleanup Project

ANALYTE	Ecological Screening Criteria (mg/kg)	Basis	95th percentile of Ambient Soil Samples (mg/kg)
OCDF	3.2	Mammal - Deer	NA
PAHs*			
benzo(a)anthracene	0.09	Bird - Hawk	NA
Explosives			
1,3-dinitrobenzene	6.3	Bird - Hawk	NA
2,4,6-trinitrotoluene	10	Mammal - Deer	NA
2,4-dinitrotoluene	8.1	Mammal - Deer	NA
2,6-dinitrotoluene	4	Mammal - Deer	NA
2-amino-4,6-dinitrotoluene	80	Plants	NA
tetryl	25	Plants	NA

*Screening based on benzo(a) anthracene. Additional ecological screening criteria may be developed based on detected PAHs.

Note:
During remediation confimation sampling, if other compounds are detected, screening levels will be developed based on the same procedure used in the RI/FS.

TBD - to be determined
NA - not applicable